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CONTENTS

Editorial Notes 689
The Smelting Company of Australia..... 690
Pollution of Streams by Mining Companies..... 690
Mexican Meeting, American Institute Mining Engineers. 692
A Gold Deposit in the Philippines.....*A. M. Howe.* 703
*An Australian Mining School..... 704
*The Sierra Mojada, Mexico, and Its Dre Deposits, *James W. Malcolmson.* 705
The Removal of Iron From Zinc Blende..... *Dr. Wm. B. Phillips.* 710
*The Klein Jig and Classifier.....*Ferdinand H. Regal.* 710
The Rayas and Mellado Mines, Guanajuato, Mexico.... 714
Note on Hydraulic Mining in Low Grade Gravel *William H. Radford.* 714
*Views of an Old Smelter in Morelos, Mexico *C. W. Pritchett.* 715
Aluminum-Zinc Alloys.....*Dr. Joseph W. Richards.* 715
Mexican Railroads and the Mining Industry..... 717
*The Zinc and Lead Deposits of North Arkansas *John C. Branner.* 718
The Republic Iron and Steel Company..... 721
*The Consolidated Franklin Mines.....*H. Foster Bain.* 721
*Outhenin-Chalandre Electrolytic Alkali Process..... *J. B. C. Kershaw.* 722
*Robins Belt Conveyors in a Stamp Mill..... 722
Abstracts of Official Reports..... 723
Recent Decisions Affecting the Mining Industry..... 723
New Publications 723
Questions and Answers..... 724
*A Briquette Plant for Fine Ores..... 724
The Turf Club Borehole at Johannesburg..... 725
*The Cyclone Drilling Machine for Testing Placer Ground 726
*The Latest Weber Gasoline Hoist..... 727
*The Dietzgen Cylindrical Blue Printing Machine..... 727
*Patents Relating to Mining and Metallurgy..... 727

Illustrated.

DEPARTMENTS

Assessments 737
Chemical: New York, Liverpool, Messina, Sicily..... 740
Coins, Foreign 741
Dividends 737
Financial Notes 740
Industrial Notes 730
Imports and Exports of Metals and Minerals..... 741
Markets: Coal, United States and Foreign..... 738
Slate 738
Iron and Steel 738
Pig Iron Production 738
Metals: Gold, Silver, Copper, Tin, Lead, Spelter, Antimony, Platinum, Quicksilver, etc..... 741
Minerals: New York Liverpool, Messina, Sicily..... 740
Mining News: United States and Foreign..... 729
Mining Stocks: United States and Foreign.....736-737
Obituary 729
Personal 729
Prices Current of Chemicals, Minerals, etc..... 744
Schools, Technical 729
Societies 729
Stock Market Review: New York, Boston, Salt Lake City, San Francisco, London, Paris.....736-737
Stock Quotations 742-743
Trade Catalogues 730

A LARGE PART of our space this week is given up to the description of the Mexican trip of the American Institute of Mining Engineers and to abstracts of the papers submitted at the business meetings held in the City of Mexico. In fact the present number is intended to be a souvenir number, giving as far as the exigencies of space and the mails will permit, a full account of this memorable meeting.

Some extended comments on the value and possible results of the Mexican meeting will be found below.

⚒

THE PAPERS read at the meeting of the Institute of Mining Engineers naturally included a number on Mexican topics suggested by the occasion. At the same time there were included in the list some valuable papers on points of general interest. Abstracts of some of these papers have been given in recent numbers of the ENGINEERING AND MINING JOURNAL, and a number are presented in the present issue, including most of the special Mexican papers.

⚒

OUR ACCOUNTS of the meeting on the trip of the American Institute of Mining Engineers will be found illustrated by reproductions of a large number of photographs taken for us in the course of the trip. They have been selected with a view of illustrating as far as possible the peculiarities of mining in Mexico and the special features which distinguish operations in that country from those in our own mining districts. Looked at in this light, they will, we think, be found to add much interest to the descriptions.

⚒

THE PAPER on Mexican Railroads which was prepared for the Institute meeting by Señor Luis Salazar at the instance of the Ministry of Fomento shows in a very striking way the possibilities of mining development created by the construction of railroads through the Republic. These transportation lines have extended the area of mining operations and permitted the opening of many new districts, and they have, moveover, made it possible to work ores of low grade, which in the old times, were left in the mines or on the dump-heaps. The furnishing of supplies at a low price and the transportation of ores from the mines to the smelters at moderate rates are among the services which the railroads have performed for the mining industry. The further extensions of railroad lines which Señor Salazar's paper outlines will add materially to the usefulness of the Mexican system, and most of these extensions are now in progress and will be completed within a comparatively short time. Not only has a great deal of foreign capital been invested in these lines, but Mexico itself is now in position to spend a considerable amount on internal improvements, and we believe that this is being done to the best advantage.

⚒

GOLD PRODUCTION in the Transvaal, from the mines now working in the vicinity of Johannesburg, is reported at 33,393 fine ounces. In the six months since resumption was permitted in May last, this makes a total output of 147,019 ounces fine gold or $3,038,883—less than one-third of an average month's production before the beginning of the war. Under existing conditions there does not appear to be any probability of an increased production since military necessities will not allow any enlargement of the volume of traffic over the railroads, and it is now difficult to transport the supplies required by the mines in operation. Nor is there any immediate prospect of a change, since the difficulties attending the operation of the railroads seem to be increasing rather than diminishing.

⚒

THE October returns of silver shipments to the East show no material change from the situation as developed in the earlier months of the year. Taking the total of the exports from British ports and from San Francisco, we find the values of the silver sent to the far East for the ten months ending October 31 as below:

	1900.	1901.	Changes.
India and the Straits.	$28,696,525	$31,844,462	I. $3,147,937
China	23,292,628	12,145,304	D. 11,147,32.
Japan	494,570	96,000	D. 398,570
Totals	$52,483,723	$44,085,766	D. $8,397,957

The moderate increase in shipments to the British East Indies was largely due to greater demand from the Straits to pay for tin, the sales to India proper showing little change from last year. Japan has ceased to be a factor of any importance in the silver market. The chief change has been in the heavy decrease—47.7 per cent—in the sales to China, which once more shows the disorganization of trade in that country, which is having a most serious effect on its imports of merchandise as well as silver.

At the average prices of the year the shipments to the East for the ten months of the current year have taken approximately 74,000,000 ounces of fine silver.

⚒

THE ZINC SMELTER combination, of which a great deal has been said recently, seems to have assumed some definite form and recent publications put the amount of capital stock to be issued at $50,000,000 and name a number of the plants which are probably to be taken into the new concern. If these statements are correct the combination will hardly be a factor to be seriously considered. The amount of capitalization named is entirely too great for any such concern to carry and it will be overloaded at the outset with a number of old and semi-obsolete plants purchased at figures far above their real value. In fact, in the list given out to the press there are very few smelting plants which are now in good condition and up to date, and unless the organization is very much changed from the present plans, it does not look as though it would be able to compete with the modern plants in the Kansas natural gas region, for instance, or with a number of others which could be named. The better works included in the proposed combination are not large enough to overbalance the dead material which will have to be carried. We are inclined to think that the consolidation will hardly go through in its present form.

⚒

FULLER DETAILS regarding the fire at the Smuggler-Union Mine, near Telluride, Colorado, modify somewhat the statements made in the press despatches of last week, but do not give any facts which invalidate the criticisms we made regarding the prevention of such disastrous occurrences. We are of the opinion that all States where mining is carried on, should pass laws that would discourage mining companies from erecting combustible buildings over shafts or at the mouths of tunnels. Where such buildings have been erected, the States should require that the companies provide some means by which the smoke and gas from a possible fire could be kept from spreading through the mine workings. It now appears that the Bullion Tunnel of the Smuggler-Union Mine was provided with doors to guard against just such an event as happened, but for some reason not stated, these doors were not closed in time. Inasmuch as some accounts state that one of the burned buildings was directly over the tunnel, and opened into it, possibly the rapid spread of the flames made it im-

possible to close the doors shortly after the fire started, and in the confusion following the discovery of the fire, no one thought of trying to close them until too late. This simply shows that less should be left to be done by men in a moment of excitement and that the doors of mine tunnels or the down-cast compartment of a shaft should be so made that they can be easily and certainly closed by some device from outside. Such a device might be actuated by a simple system of levers and wire rope or by compressed air. In any event, the cost of installation would be a mere trifle compared with the prevention of possible damage to the mine, to say nothing of the guarantee of safety to the men below ground.

One point we note from the later accounts, and that is that the loss of life was less than that reported in the first despatches. This is often the case, as there is a natural tendency to exaggeration in the first confusion.

⚒

THE MEXICAN EXCURSION OF THE INSTITUTE

The American Institute of Mining Engineers has just completed one of the most important meetings in its history. Many previous plans for a visit to Mexico have been abandoned in the preliminary stages, because of the difficulty of securing a representative gathering of the Institute for so long a journey extending so far out of the United States. This makes it especially significant that the present invitation from Mexico was responded to by a company of engineers, requiring two long trains for the accommodation of the 160 persons who finally gathered for the journey. The Institute met with an ovation over the entire route. The attentions heaped upon the members included far more invitations than they could possibly accept in the limited time set for a journey over a great territory. Even before the return, engagements have been made by many members to go back and study in detail the mining camps which lack of time made it necessary to omit.

Considering the thorough exhibit of Mexican mining shown to the Institute at the last meeting at the Pan-American Exposition, the time for visiting Mexico was of maximum significance to the industry. The exhibit at Buffalo was most comprehensive, and especially valuable in showing Mexico's wealth in the less fascinating, but essential minor mineral products. The mining of coal, iron ores, manganese, pyrites, petroleum, and a host of smaller products, mean cheaper transportation, lower cost of mining and especially smelting, for the precious metals, which offer the principal attraction for a visit to Mexico.

Our Mexican hosts lost no opportunity to show the resources of the country from every point of view, and the ties of good fellowship due to their untiring courtesy, have been made stronger than ever.

Not the least benefit from the convention is the hope of a return visit from the Mexican engineers to this country. No doubt the returning trains have brought many of the hosts back with them, to study mining conditions in the United States. For this the time is also fortunate. Before they leave Texas the fuel possibilities of Beaumont cannot fail to excite exploration for the possible extension of this field into Mexico, and there is no phase of the mining industry which needs more development than Mexico's fuel supply. But we hope for more than this. The next meeting of the Institute should include, wherever it may be held, a delegation from Mexico, intent upon taking part in the discussions for the mutual benefit of the mining profession; and they may be sure of a welcome, measured only by the hospitality so profusely shown to our own citizens.

The condensed telegrams which have appeared in previous numbers of the ENGINEERING AND MINING JOURNAL, and the fuller accounts which we present in the following pages, show in some degree the heartiness of the welcome tendered to the members of the American Institute everywhere, and the extent of the preparations made for their entertainment. Everywhere mines and works were thrown open for inspection, and every facility was given the visitors who desired to see and study the workings of plants and mines. We do not believe that in any other country in the world such full confidence would or could have been shown to a party of foreign experts.

The relations between the mining interests of the United States and Mexico have always been close. As Señor Aragon and President Olcott remarked in their speeches at the opening meeting in the City of Mexico, when the first ventures at gold mining on an extensive scale were made in California, it was to Mexico that we looked, not only for miners, but for precedents and advice. It was Mexican practice that was followed, and some of our best machinery has been evolved from the Chilean mill, the arrastra, the patio and other devices which had been used for centuries in our sister Republic. Now we are returning past favors; machinery and capital from the United States are doing much to aid in the development of Mexican mines. As Mr. Olcott admitted, we made a mistake when we failed to adopt also the regulations of the Mexican mining law, which have stood the test of centuries, and are, in some important respects, clearer and more equitable than our own.

From the early days of the sixteenth century Mexico has been famous as a silver producer; but, while the white metal still forms the most important part of the mineral output, there are many sign of change in this respect. The gold production is rapidly and steadily increasing; and, more important still, there are many indications that the copper production will become an important factor in the world's industry. The great mines at Boleo, at Nacosari and elsewhere are still new, and there is reason to believe that others will be added, and that the output of copper will expand steadily. Copper and iron in addition to the precious metals—not to mention the minor metals referred to above—will make Mexico the foremost mining country in the world, in proportion to its size.

The visit of the Institute of Mining Engineers will help us to know better and to appreciate more than ever before the importance of the Mexican mining industry. We believe also that it will help materially in promoting good feeling and in teaching the two nations how closely their interests run together, and the extent to which a mutual understanding will promote their mutual interests.

That the two great Republics of North America may be united by close ties of friendship, commerce and good will is the earnest hope of the ENGINEERING AND MINING JOURNAL and to promote this end its best efforts will be made.

⚒

THE SMELTING COMPANY OF AUSTRALIA.

AN attempt has been made in London to resuscitate the Smelting Company of Australia, which has been in a state of suspended animation for three years or so. This company was originally formed in 1895 to erect modern smelters at Illawarra, New South Wales, and to acquire interests in several silver lead properties. It had the advantage of being near cheap coal supplies, and the directorates in England and Australia were composed of influential men, while Mr. John Howell—at one time general manager of the Broken Hill Proprietary—was manager. The scheme, however, was never a success, and was only three years in active operation. For one thing the smelting of Broken Hill ores was just on the transition period between carbonates and sulphides, and no settled system was in vogue for treating the latter. Secondly, the richer ores had been exhausted and economies had to be devised and worked out. It was thus an inauspicious time for starting such a company. Mr. Howell received his training in the treatment of Broken Hill ores during the rich carbonate period, and in those days economies were not considered at all, so that his experience was not adapted to the problems to be tackled by the Smelting Company of Australia. The present company, that has just been formed to take over the business, is called the Smelting & Refining Company of Australia, Limited. It has been formed by Mr. Salisbury-Jones and his friends, but many of the shareholders and directors of the old company are supporting him by underwriting shares. The capital is £650,000 in 150,000 preference shares of £1 each and 500,000 ordinary shares of £1 each, besides which there is £100,000 in debentures. The preference shares are now being offered for subscription in London, and of these two-thirds have already been underwritten. The terms of purchase are somewhat complicated, owing to the old company having debentures and other debts to wipe off. The new debentures go towards wiping out the old ones, but there are many debts that have to be paid off in cash, so that there will be very little capital left to start actual operations on and to buy ores with. It is a remarkable fact that "good will" is represented in the purchase price to the extent of £284,750. An unsuccessful company that has landed in debt does not usually charge for good will. Two American metallurgists, Messrs. A. A. Blow and Philip S. Morse, have charge of the works now, and it is to be hoped they will succeed better than present prospects indicate.

⚒

POLLUTION OF STREAMS BY MINING COMPANIES.

A decision of considerable importance to the coal mining companies of Pennsylvania, especially in the anthracite region, has just been rendered by the Supreme Court of that State. The case has been before the courts for several years, originating in Schuylkill County where the Court of Common Pleas decided against the mining companies, and two appeals were taken, which finally brought the case to the court of last resort.

The suit was brought in the first place against the Lehigh Coal and Navigation Company to recover damages for polluting Panther Creek by flooding the stream with coal dirt and refuse from the mines. The plaintiff in the case owned a grist mill on the stream which he claimed had been injured by the dirt and silt carried into his dam and race, and the lower court awarded $4,900 to cover the injury done. The amount at issue in this case was not particularly large, but as it is a test case which will cover a number of other suits which have been brought or are waiting for this decision, its importance to the companies is very much greater than the number of dollars absolutely at issue.

From an early date it was the practice of the collieries in the anthracite region to run the mine water, carrying with it a very large amount of coal dust and waste, into the nearest convenient stream. Even when the extent of mining business was comparatively small there was more or less controversy over this and when the collieries became more numerous several of the companies built retaining dams, and other works at considerable expense in order to provide places where the coal and dust

tailings could be dumped. This was not universally done, however, and much of the refuse continued to find its way into the streams until the waters of the Lehigh, Nescopec, Lackawanna and other rivers throughout the region became thoroughly polluted.

Of late years there has been some improvement in this respect, which was rendered absolutely necessary by the growth of the towns and cities through the anthracite country and the difficulty of obtaining a proper supply of water for them as long as the pollution of the streams continued. In some cases, however, the expenses of the necessary work were paid for by the cities and towns and not by the companies, while at some collieries refuse was dumped on the banks of the streams only to be carried away by the spring floods. The condition, in short, has been unsatisfactory and the right of the people to the use of the water unpolluted by refuse has not by any means been recognized by the companies.

In this decision the language of the Supreme Court is very clear and not only supports the decision of the Court of Common Pleas, but even goes considerably beyond it. Thus the opinion of the court below held that the injury to the plaintiffs was not permanent and that the dam and race could be cleared of coal dirt at a cost very much less than the water power; but while this point was correct, the very nature of the operation showed that as it had been conducted there was practically a continuous interference with the proper use of the water by means of the continued loading of the stream with dirt. It was correct therefore not only to assess the damages actually sustained by the plaintiffs, but also to restrain the defendant company by an injunction from polluting the waters of the creek in the manner described in the complaint.

In this case, as in other similar actions, the injunction of the court is the appropriate resort for the prevention of trespasses and nuisances which are persisted in and which threaten to become permanent in their nature. Ample authority may be found for this both in the Common Law and in the statutes of Pennsylvania and the Supreme Court therefore sustained and confirmed the perpetual injunction against the Lehigh Coal and Navigation Company granted by the lower court. It becomes apparent that if this case is followed up by other suits—as it will be in all probability—during the next few years some of the anthracite companies will be put to considerable expense in providing retaining dams and dumping grounds. In some cases there may be serious difficulties involved in the construction of such works, but that they will be required in the future there is no doubt.

⚒

MARKET CONDITIONS.

No material change can be reported this week in the condition of the various markets and there is no sensible diminution in the activity of business.

The copper market remains unchanged as far as the prices are concerned, though there is said to be more inquiry for the metal. As noted last week, early deliveries are not to be had and sales now made are mostly for December and January delivery, although contracts for the first named month are generally filled up. The foreign markets are also nearly stationary. Export business has not been active, although it is well known that stocks of the metal in Europe are low and manufacturers generally but poorly supplied. At the same time business is not active and in Great Britain especially there has been a sharp falling off in orders for new ships, so that the demand for copper required for this purpose is likely to be small for some time to come. Of course there have been the usual number of rumors as to possible reduction of prices, but they have no more substantial basis than those noted in previous weeks.

In other metals very little change is reported. The demand for lead continues fair but no change in prices has been made. The spelter market continues active, both brass founders and galvanizers being filled with orders. There has been talk about a new zinc smelter combination which is referred to more fully elsewhere, and which does not seem to be of importance. Tin is still unsettled and the speculative interest in this metal is taking full charge of the situation.

In the iron and steel markets there is no apparent slackening in the great activity which marks the trade. December is generally looked forward to as a dull month, but this year there is every probability that it will be an exception to the rule, as new contracts for all sorts of finished material continue to come forward. The main features of the present week have been advances from 25 to 50 cents per ton on pig iron in the Pittsburg market. The congestion of the railroads and the car shortage continue to interefere with the operations of the furnaces and mills and to reduce the production to some extent at a time when there is urgent demand for all of the material which can be had. This has given rise to some reports of increases in quotations, but it does not appear that these are in general, the foundation of the rumor being the payment of premiums for early deliveries. The rail business continues very active and in addition to the orders for standard sections, many contracts are coming forward for girder rails and other materials for electric railroad enterprises now under way. Believing generally the condition of the iron market is everywhere quite as strong as it has been for some weeks past.

Discussion continues over the reported new steel consolidation for which negotiations have been in progress for some time. No conclusion, however, seems to have been reached, and there are many difcutlies still in the way of harmonizing the interests which must be included. While such a consolidation would be of much importance it would not be possible to form a combination which would rival in importance the United States Steel Corporation for the reason that the material for another combination of equal magnitude does not exist. It seems quite the reason that the material for another combination union of the large plate mills, but whether such a concern would be controlled by the United States Corporation or by its opponents is an open question.

The anthracite coal trade remains in an unchanged condition. Production continues large and is absorbed without difficulty. The recent storms are interfering somewhat with the coastwise trade and have caused a general increase of freight rates. At the same time, however, the early advent of cold weather is hastening demand from the large cities.

The seaboard bituminous coal trade is limited for the present as the railroads seem to be unable to supply the cars wanted or to move them promptly when loaded. The coastwise trade is also affected by the coastwise shipping conditions above referred to under anthracite.

In the western coal trade car shortage, as in the east, is the thing that is most affecting business at present. It is impossible for shippers to get the cars they need and coal is accumulating at the mines, when it is urgently wanted elsewhere. The Lake trade is suffering especially from these conditions and it is clear that these shipments to the Northwest will fall far short of the contracts taken earlier in the season. This is especially provoking to the shippers because the vessel tonnage on the lakes is abundant just now.

The Pittsburg river trade seems to be temporarily tied up by the disagreement between the large companies on the one hand and the river pilots on the other. The Monongahela Company at Pittsburg has some 25,000,000 bushels of coal loaded and tied up in consequence of this dispute, and has not therefore been able to take advantage of the rise in the Ohio river resulting from the recent storms. This may result in curtailing the Mississippi trade unless there should be another rise before the rivers freeze up; and it may turn out largely to the advantage of the Alabama mines which are now shipping coal to New Orleans and other points on the lower Mississippi.

⚒

TESTS OF VENTILATING FANS.—We are informed that the committee on mechanical ventilation of the Institution of Mining Engineers, of Great Britain, is anxious to receive suggestions as to fans suitable for the ventilation of mines, of which tests can be made. Communications may be sent to Mr. M. Walton Brown, secretary, Newcastle-upon-Tyne, England.

⚒

STORAGE BATTERY PLATE.—Mr. Leonard Paget, of New York, has patented under date of November 12, an interesting method of making storage battery plates of the type in which a grind or support is dispensed with, the active material being itself hardened into a strong and light plate, with which connection is directly made by soldering or otherwise. The composition used consists of 4 parts of litharge or other oxide of lead, 1 part of lead sulphate, and from 1 to 2 parts of zinc dust, the ingredients being mixed dry, pressed into shape, and while under pressure carefully and evenly moistened with water. Reaction ensues rapidly, the zinc reducing the lead from its sulphate and the mass hardening at once to a stone-like composition. The zinc sulphate must then be washed out, an operation best effected in an electrolytic vat in which the plate is connected as cathode, whereby the rate of solution is somewhat lessened and disintegration of the plate avoided. The plates so prepared are then electrolytically formed as usual and mounted for use in conjunction with any of the ordinary electrolytes.

THE ONTARIO GOVERNMENT ASSAY OFFICE.—The laboratory report of the Ontario Government Assay Office located at Belleville and conducted by the Bureau of Mines for the assistance of prospectors and development of mineral lands, shows a total receipt of 139 samples sent in for examination during the month of October.

The assays and analytical determinations aggregated 381, each checked off by a duplicate in order to avoid errors before issuing certificates. Of these 49 were for gold, 34 silver, 7 nickel, 19 copper, etc.

Sixteen samples of iron ores from different parts of Ontario were received for partial or complete examination as to smelting quality.

Sixty-one samples of raw and briquetted peat were received for analysis as to quality for fuel purposes.

The Bureau of Mines required 251 determinattions on which no fees were collected, 130 being done for private parties. The custom work for the public is done at actual cost, fees collected from all this source amounting to $111.95.

Seventy-three samples for identification, or report as to probable commercial value, as well as for qualitative examinations, were received, on which fees amounting to $15.20 were collected. No charge is made for such examinations on samples brought personally to the laboratory.

The office supplies, free of charge, canvas shipping bags, and manilla mailing envelopes for small and crushed samples, to those requiring the use of such.

THE MEXICAN MEETING OF THE AMERICAN INSTITUTE OF MINING ENGINEERS.

EDITORIAL CORRESPONDENCE.

In the telegraphic despatches published in previous numbers, we outlined the progress of the special trains carrying the Institute to the City of Mexico. The first formal meeting was held there on Saturday evening, November 9, and, as noted, was occupied chiefly by addresses of welcome from representatives of the general Government and others.

The address of welcome of the Minister of Fomento (Industrial Encouragement) was delivered by Ing. Don. Augustin Aragon, who also acted as the spokesman for the Academy of Sciences, the Association of Engineers and Architects, and the School of Mining Engineering. The address was delivered in Spanish first by Sr. Aragon and then repeated in English by Sr. Braschi, and was as follows:

"Members of the American Institute of Mining Engineers:

"Owing to the fact that I have the rare good fortune to belong to the Society of Engineers and Architects and to the Academy of Physical and Natural Science, to the further fact that I have received my professional education in the National School of Engineers and that I belonged to the staff of employes of the Department of Fomento, I have been entrusted, in the name and on behalf of all the above named institutions and of the Minister of Fomento, with the honorable and gratifying duty of welcoming you upon your arrival in this capital, where we hope and desire that you may be welcomed with the cordial hospitality to which you are entitled as the representatives of a famous and meritorious organization.

"We hope that your visit to this country may not only be pleasant to you by reason of our fine climate, our beautiful scenery and historical associations, but also instructive in the science and art which are your specialty and which by your perseverence, your energy, and your ability you have carried in the United States to an astonishing degree of perfection.

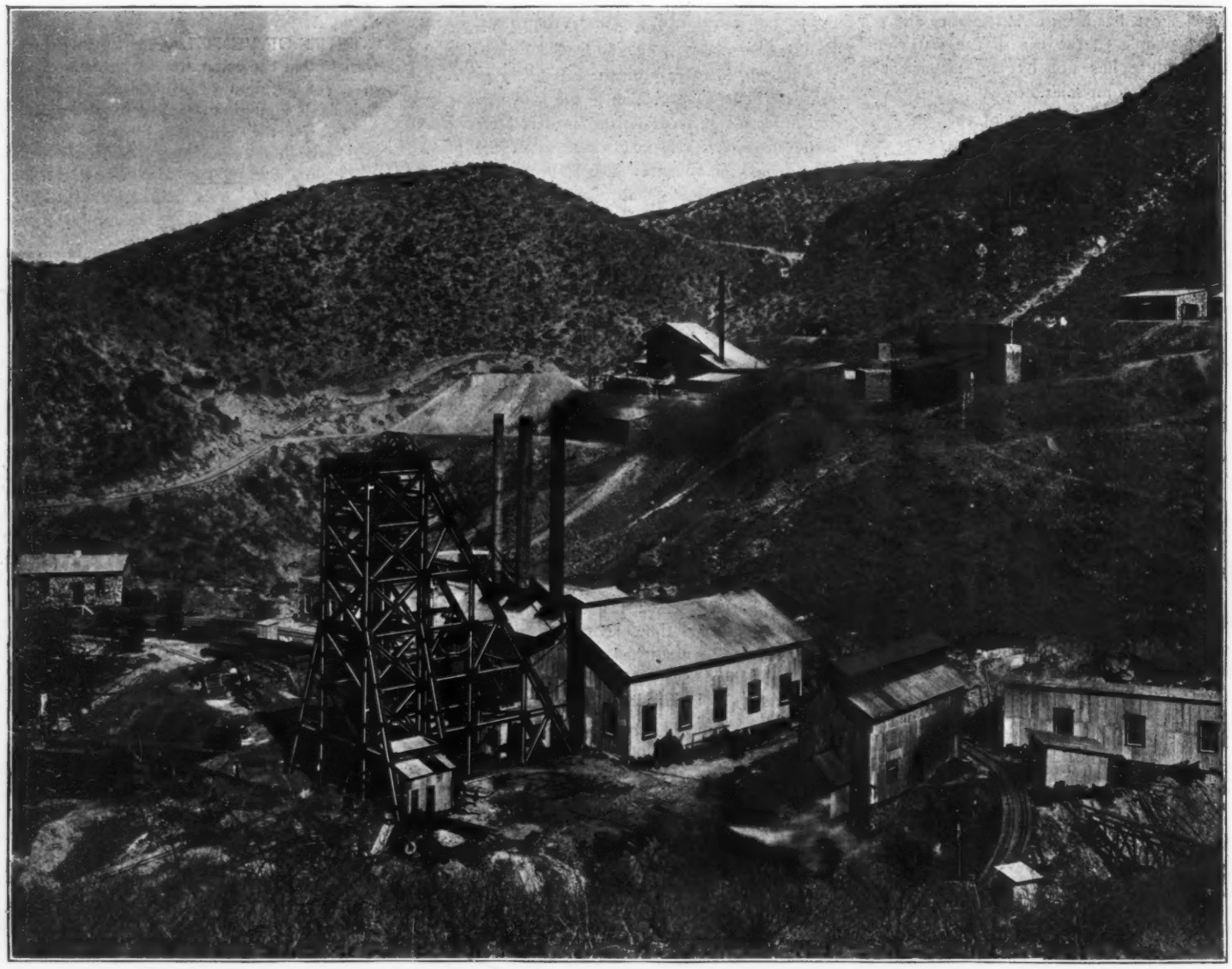
"Undoubtedly travel and excursions form an important factor of education and amusement. To the engineer they are also a source of economic utility, inasmuch as by visiting new localities and new countries, he is enabled to judge personally of industrial methods, of the progress of applied science and the conditions of life among his professional brethren who may be more or perhaps less favored by fortune than he and if among the faculties which he has cultivated he possesses that of observation, he receives from travel a practical lesson of the most varied and useful kind.

"We hope that beneath the perfect skies of our fatherland you will find not only the rest to which your active lives in your homes beyond the Bravo entitle you, but also food for instructive reflections suggested by the contrast between that which you are about to see and that which you are accustomed to contemplate in your own country. Here you will see the historical mines opened up shortly after the conquest and the mining and metallurgical methods of the same epoch born of necessity (which, as you well know, is the mother of invention) in order to minister to the aggressive energy of our indomitable conquerors. Side by side with those glorious relics of past ages, you will, in your visits to our mining localities, observe all the appliances with which modern science and art have prodigally enriched the mining industry both for the exploitation of mineral deposits and the reduction of the ore, all of which appliances are of course entirely familiar to you.

"Seeing that I have referred to past times, it may not be superfluous to recall one or two dates in the history of mining in Mexico, not boastfully, but in proof of the claim freely accorded to us of being the pioneer miners of the New World. I desire to refer to the first coinage of money here in the year 1537, the discovery of the system of amalgamation by Bartolome de Medina in 1557 at Pachuca and the opening of the School of Mines on January 1, 1792.

"In a country like Mexico which possesses almost all known kinds of minerals, and, among whose industries mining occupies in every sense the foremost rank, men who devote their thoughts and labors to the subject cannot but rejoice at being visited by persons so thoroughly versed as yourselves in all the branches of knowledge connected with the rational exploitation of metalliferous formations, ranging from the fundamental data of geology to the metallurgy of the industrial product and from mineralogical prospecting to the installation of huge and complicated machinery destined to overcome natural obstacles.

"In proof of my assertion I would point to the presence at this inaugural session of the distingu-



SANTO DOMINGO MINE, SANTA EULALIA, NEAR CHIHUAHUA.

ished citizen, who administers the department which has charge of the mining interests of the country and of the esteemed director and president as well as the members, of the three corporations on whose behalf I am addressing you and which by reason of their object are intimately connected with the scientific studies of mining in its varied aspects. Another proof of the interest felt in your work is the fact that the Supreme Government, through the Department of Justice and Public Instruction has placed at your disposal for your meetings this the auditorium of the old School of Mines.

"In connection with the conquests which mining has achieved in overcoming the forces of nature, either by deviating their course or moderating their intensity, permit me to say a few words with regard to the social and moral consequences of these conquests.

"The phenomena of nature are greatly modified by the action of man upon the planet and it is precisely that struggle (never absent from mining operations) against the natural medium, (which, even under the most favorable circumstances does not yield the richest fruits of which it is capable, save in response to man's efforts,) that constitutes the essential basis of the progress of nations.

"It is clear that that struggle must be in inverse ratio to the facilities which the soil and climate offer to mining operations and to their adaptation to man's wants, and that, therefore, there are countries where greater energy is needed than in others which are less unpropitious, as undoubtedly, in comparison with Mexico are not a few of the countries of Europe and America. But if this circumstance explains a certain backwardness in the development of the less favored country and to a certain degree lessens its responsibilities, seeing that it has had to contend with greater difficulties, it obliges it on the other hand, morally speaking, to more constant and sustained efforts with a view to overcoming its natural obstacles. Thus the first and most important social question for each nation is how to modify the physical medium in which it lives and it must devote to that task, which is the foundation of all national development, the greater part of its strength and attention. This is how the nations that have been most conspicuous in history have acted; so much so that many of them, occupying regions possessing few natural advantages, owe their position simply to the efforts of their people.

"The United States has had as natural allies in its successful development, the fertility of its territory, its great rivers, the abundant supply of subterannean water in many regions and the mineral wealth of its soil, all of which things have contributed so largely to its industrial expansion. Another powerful factor in its favor is the immense extent of its coasts offering unrivaled opportunities for the development of commercial navigation.

"Mexico is not so favorably situated except with respect to its mineral wealth, for, although it has a great extent of coast, its shore line is not indented in such manner as to facilitate commerce and navigation. Thus it is that natural conditions have from the earliest times marked out the fundamental laws which, under penalty of great evils, each nation must obey in the process of its organization and development.

"And seeing that the similarity of the sub-soils of our respective countries and their proximity have given rise to a reciprocal interest in learning the condition of one another's mining industry, we consider it to be a duty on our part to throw open to you our museums, our mines and our reduction works, in order that you may inspect our mineral collections, our systems of mining, our metallurgical processes, for the interchange of ideas incidental to this class of reunions is not the least of their advantages.

"Our ancestors were accustomed to inaugurate every important enterprise, every momentous occasion, every useful institution, with the ceremonies of religion. Their fervent piety considered nothing to be noble, great nor sublime unless undertaken under the auspices of the divine favor. Nowadays we place ourselves under the aegis of science and those of us who march under its colors, with or without theological creed or political affiliations, invoke, above all things, when we meet to discuss and promote the welfare of mankind, the spirit of international co-operation, which reunions of this kind tend to propagate, gathering as they do together from different countries men devoted to the cultivation of science, that treasure house enriched by the patient accumulations of savants during the course of the centuries and fortified by the indestructible hope of the ultimate brotherhood of man.

"We confidently hope that the fraternization of men of science in the United States and Mexico may ever grow closer and we look for even pleasanter days in the future than those which we are about to enjoy on the occasion of your first collective visit. What role does the future reserve for our countries and what will be for us the complexion of the ages to come? The course of history does not warrant prophesies, but a careful study of past ages frequently affords an insight into future probabilities and when in all ages, throughout every crisis, in every medium, we observe that the language in which men have most universally reached a common understanding is that of science, we may fairly conclude that the apostleship of fraternity in future ages is reserved for the men who faithfully, earnestly and enthusiastically devote their lives to the study of natural phenomena.

"We receive you, therefore, as professional brethren and as intellectual sons of the same century. Welcome, therefore, to you members of the American Institute of Mining Engineers; and during your stay in our midst we hope not only that our scenery may delight you and our welcome gratify you, but that it may also be attended with intellectual results, for thus, upon returning to your home you will carry with you grateful memories of your excursion to Mexico and will be missionaries to tell of the cordial welcome here extended to men of science, particularly to those who are living examples of the motto on which every intellectual worker ought to pride himself: 'For Science, Fatherland and Humanity.'"

In responding to the address of welcome, President Olcott spoke in Spanish, the interpretation of his address being as follows:

"It is inspiring that this first meeting of the American Institute of Mining Engineers in Spanish-America should be convened in the Mexican National School of Engineering, formerly called the School of Mines.

"We, on our side of the Rio Grande, have something to be proud of in the magnitude of our operations and in the rapid advance which we have made not only in mining engineering, but along all lines. It is wholesome that we should assemble here before this brilliant audience, and should turn our thoughts backward and consider what we owe to the Latin races for our start. Was it not your Spanish ancestors, Mr. President, who discovered the shores of the western hemisphere, and was not their quest for gold one of the great moving causes which lured them on? Our institutions, our great mining enterprises, date back but a few decades, while you can point out operations that have been moving along steadily for hundreds of years.

"When we discovered the Comstock Lode and our other western mines of early date, where did we get our first miners except from this country, where we are now being so royally entertained? And when it comes to treating our ores, on whom did we call for knowledge, but on the Mexicans who taught us their patio process, and we merely modified it into the Washoe pan mills, merely your arrastras made of iron. Since then we have learned to love the word 'Pan,' and prefix it to all our congresses, and all of our expositions. In early days we only thought of the grinding that was going on, and of the amalgamation of our silver ores, but now the magic word is making the people of all the western hemisphere more of one heart, a people of one interest in developing the immense riches with which nature has blessed us.

"Where did we get much of our nomenclature, if not from the beautiful Spanish language? Have we not received our bonanzas from you? Are there not more hidden in your mighty mountains, which all of us wish to see developed in the best, most economical and most profitable manner?

"We did not, unfortunately, found our mining law on yours; if we had done so the vexatious perplexities of the apex question would have been avoided, and the rational understandable rectangular claims would have been adopted.

"With a history in mining which surpasses all, with a present of tremendous importance, and with a future of brightest promise, Mexico is par excellence the Mecca for a congress of miners.

"This magnificent edifice was erected for the accommodation of mining students, before our people had awakened to the idea of our own possessions of mineral wealth. It behooves us Americans then to put away arrogance, as we enter your portals; to tread lightly the sacred halls; to look in reverence on your institutions, and to learn well the lessons which you can still teach us, of systematic perseverance. We are energetic and wish to rush through our work in minutes, but we have much to learn from those who display the beautiful grace of patience.

"This meeting stands historically for several things. It marks the beginning of the thirtieth year of our institution; it marks the opening of the momentous twentieth century; it marks the heartier co-operation of the different nations on this side of the Atlantic.

"If your progress and ours has been so great in the past 30 years, what may be expected in the first 30 years of this new century? 'Strength begets strength.' 'Well begun, half done.' You have advanced prodigiously recently. National and commercial ratings are such that the founding of enterprises of all sorts is easier and the interest charge not so serious as in former times. The multiplication of quicker methods of communication has not only developed your resources but has also put the menace of rebellion further away.

"Our tariff legislation put a high duty on lead ores, and attracted capital to establish immense smelting works which have gotten you a market close at hand for your ores. Compare your adobe furnaces 8 feet high with the present 'hornos altos.' And, last but not least, the maintenance of the highest national credit under the guiding hand of the splendid statesman who holds the helm of the government, and the honorable payment of your public debt.

"It marks you a people that must be reckoned with. Mexico, like the United States, is suffering from an embarrassment of riches. No other nations on earth have to bother their heads as to what disposition to make of their surplus.

"The grand engineering schemes undertaken in Mexico in the last few years have involved the placing of millions of money in public betterments, nearly $40,000,000 for harbors, $18,000,000 for canals.

"We want to learn, while here, why it is that in this happy land strikes are unknown. It must be that sweet contentment blesses the hearthstone, and a man is free to go to his work as his needs and inclinations direct. May the blessings of this peace rest long upon you.

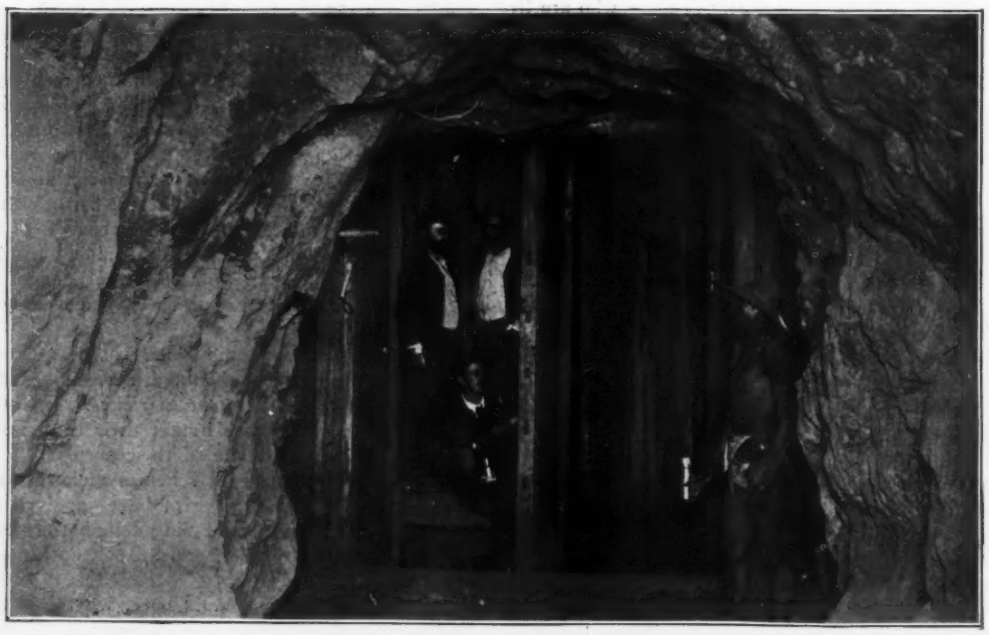
"There has been a notable increase of imports into Mexico from the United States as against a large decrease of those from England and the comparatively small increase of imports from France, Germany and Spain. The same is true in regard to exports. There has been a phenomenal increase in the past two decades in metals and

goods shipped to the United States as against the bare maintenance or the decrease in the amount sent to Europe. We should not flatter ourselves in regard to this. Shame on us if it were not so with our juxtaposition and our railroads and steamship facilities! But these conditions emphasize the necessity for more brotherly love between us, more helpfulness, less spirit of competition, and more of mutual assistance.

"Mexico now ranks third among the corn raising countries of the world. Exports of agricultural products have more than doubled in the last eight years. The wonderful variety and quantities of what might be termed precious woods are a great source of national wealth as is also the production of henequen the annual sales of which have reached $33,000,000.

"Mexico has been and is to be congratulated and highly complimented for the large part she has taken in that marvel of beauty that climax of up-to-date successes, the Pan-American Exposition at Buffalo. The spirit of the Pan-American idea, the spirit of hope engendered by that rainbow city was never so strong as now. Let us all make generous endeavor that it may be lived up to in spirit and in truth. One of the greatest bonds for the security, the welfare and the advancement of Pan-America is an interoceanic canal. It has been talked of so long that the language of the early promoters has become a quaint tongue. Let us hope and assist as we may that under our newer condition action of some sort may begin. May the scream of the bald eagle of the north call forth an echoing hello from his brothers of the south—not ever, we pray, in defiance, but in inspiring rivalry and neighborly co-operation.

"Whatever measure of success has come to us of the States aside from our natural advantages, we almost with one accord attribute to our belief in God, in the truth and in our common schools which teach us to find, to measure and to know the truth. So here we find a nation so compactly situated and so all sufficient in its resources that for hundreds of years she has lived largely for herself and to herself. She has been so hemmed in by unpropitious coast lines, mountainous borders and vast distances that international exchanges were difficult. Return cargoes for ships were hard to secure as her chief products, although of great value, were of small bulk, and so until the advent of the great advance agent of progress, the railroad, was installed over the length and breadth of the land the vast wealth of many of her richest States lay dormant. Great men, great hearts and a great nation not very many years ago seemed to demand this newer life and all things seemed to have worked together for the common advance until now the call of progress is answered day by day more and more from every part of the united and splendid nation. Here, too, we find a devout nation, and here we see springing up on all sides, the common schools, which, like ours, tend to broaden and make more tolerant the opinions and religious beliefs of people whose faith differs from our own."



IN THE VETA GRANDE SHAFT, SIERRA MOJADA.

The speaking was concluded by a happy and graceful address by Sr. Ing. Ezequiel Ordonez, one of the professors in the school of engineering. This terminated the inaugural session of the meeting. The speeches had been preceded and were interspersed by delightful musical selections rendered by the orchestra of the National Conservatory of Music. The room in which the meeting was held had just been completed and the sessions of the Institute have been practically the dedication of the hall to its useful purposes.

Sunday, November 10, was left free for the visitors to entertain themselves as they desired. None of them found it a long or tedious day. Visits were made in the morning to the flower market, the Cathedral and other interesting places in the city. In the afternoon most of the visitors drove out to Chapultepec, the home of President Diaz and many took dinner at the restaurant located at the foot of the mound upon which rests, as a crown, the famous palace.

On Monday, November 11, shortly after 9 o'clock the first technical session of the Institute held in Mexico was called to order by President Olcott, with Mr. Theodore Dwight as acting secretary in the place of Dr. R. W. Raymond, whose absence has been deeply deplored by all.

MEXICAN MINERS AT WORK, ZACATECAS.

The first paper on the program was one by Sr. Martinez Vaca on the mining laws of Mexico. The paper itself was of considerable length, and an abstract of it only was read by Sr. Ordonez. Sr. Ordonez also read the abstract of a paper by Sr. A. Aguilera on the mineral deposits of Mexico. Both of these papers were prepared under the special instructions of the Minister of Fomento. The discussion of these papers, which was participated in by Dr. James Douglas, Prof. S. F. Emmons and Mr. Olcott, was very interesting. Dr. Douglas spoke principally on the superiority of the Mexican mining laws as compared with those of the United States, a subject upon which he claimed the right to talk as one engaged in mining on both sides of the line. He paid a high and deserved tribute to the simple and efficient mining laws of Mexico which avoided any such complications and annoyances as attended the attempts to carry out the "apex" law under which the mining interests of the United States have suffered and the lawyer grown fat and prosperous. The apex laws of the United States were evidently devised by legislative bodies composed largely of lawyers who had the interests of their craft principally at heart. The mining laws of Mexico are ideal in their simplicity and effectiveness. The payment of $100, annually, on each claim gives absolute title to the mine or prospect owner and provides a revenue for the Government, whereas the doing of $100 worth of assessment work on a claim in the United States is a varying quantity and yields no returns to the state.

Prof. Emmons, in discussing Sr. Aguileras' paper, which he said he had not had time to read carefully, called attention to the fact that the ore-bearing rocks of Mexico were chiefly of Cretaceous age, the mineralization being most pronounced in the contacts between the sedimentary and the later eruptures.

At 11 o'clock the meeting adjourned and the members were escorted through the School of Mines. This over, they were driven to the Cathedral and then to the National Library. In the afternoon special electric trains were provided to convey the visitors to Tlalpan, a most interesting suburb of the city, and thence to the ruins of the palace of

Cortez. The return to the city was made in good time to enable the guests to dine and dress for the reception tendered by the mayor and City Government at the Municipal Palace. This was a most brilliant social affair; and moreover, it was an incident of rare occurrence in the City of Mexico. The only other recent occasion of this kind was a reception given in honor of the delegates to the Pan-American Congress, which is now in session

OPERA HOUSE AND MUNICIPAL PALACE, CHIHUAHUA.

in this city. The guests on Monday evening were received by Guillermo de Landa y Escandon, governor of the Federal District, and Jose Algara, mayor of the city. The usual collation was served about 10 o'clock, at which the also usual address of welcome (this one being made by the mayor) and the happy, well timed response by President Olcott were given.

Tuesday began with the second and final session of the Institute in the City of Mexico. It was called for 9 o'clock but it was nearly 10 before the members got together. At this meeting a number of papers were presented by title, most of which have either been already published in the JOURNAL or are given in another part of this issue. Sr. Ordonez read in English an abstract of a paper on "Mexican Railroads and the Mining Industry" by Sr. Luis Salazar, an able and well known Mexican engineer. At the conclusion of Sr. Salazar's paper, a few well timed remarks were made by Mr. Cleveland Dodge of New York, who is interested in a number of Mexican mining properties. In his remarks, which were brief, Mr. Dodge spoke of the wonderful development which had followed railroad building in this country, and predicted that the greatest mining development in the future would be on the west coast, which at the present time was practically untouched.

The technical session ended with an extemporary address by Dr. James Douglas on the mining and treatment of the low-grade copper ores at Los Pilares Mine in the Nacosari District, State of Sonora. The most interesting feature of Dr. Douglas' address was the description of the method of producing and using a mixture of water and producer gas for power purposes. The producer gas is made from wood of too poor a quality to make steam, but does make an explosive gas adaptable for gas engines. The water gas is made by the introduction of steam over the fire-box and drawing it down through the bed of incandescent fuel. The air is also fed over the grate bars distilling producer gas from the wood, and the mixture obtained makes an excellent fuel for explosive engines but having a low calorific value. This plant was fully described in the ENGINEERING AND MINING JOURNAL for May 11, 1901.

Other papers presented in manuscript by title at this session were:

Notes on a Section across the Sierra Madre Occidental of Chiahuahua and Sinaloa; also Notes on a Few Mines in the States of Chihuahua and Sinaloa, by Walter H. Weed, United States Geological Survey.

Notes on the Structure of Ore-bearing Rocks in Mexico, by Edward Halse.

An Adobe Reverberatory Furnace, by John Gross, Sombrerete, Zacatecas.

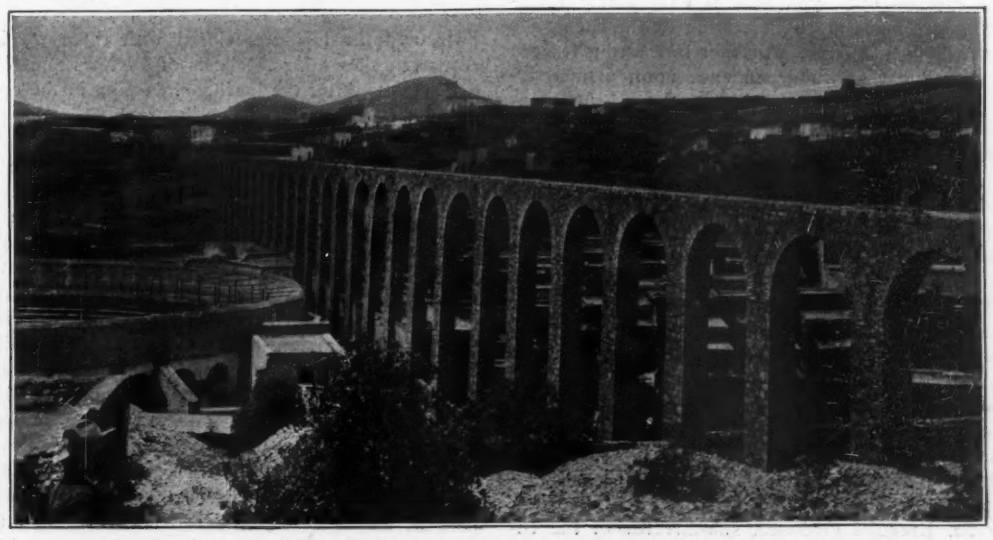
The Detection and Estimation of Small Quantities of Gold and Silver, by John L. Wagner.

Mr. Olcott then proposed that the rules be suspended and that Sr. Manuel M. Contreras, mathematician and engineer, former mayor of the city and at present a member of the Mexican Senate, whose name had been proposed for membership, be elected by acclamation. It was done by a rising unanimous vote. Sr. Contreras, who was present, acknowledged the compliment in a graceful speech. A cordial vote of thanks to the Mexican hosts was proposed and passed, and the secretary instructed to carry them out by letter. The meeting then adjourned. At 11 o'clock the visitors were taken and driven to the National Museum and Academy of Fine Arts.

At 3:30 p. m. the visitors were entertained by an occasion not outlined on the printed programs —a reception by General Don Porfirio Diaz, President of the Republic. This opportunity to see and grasp the hand of one of the greatest men of modern history was fully appreciated by all, and every member, guest and lady of the party was at the palace at Chapultepec promptly at the stated hour. The reception had been arranged through Hon. Powell Clayton, the United States Ambassador, who introduced the party. The President received them simply, unaccompanied by any cabinet ministers or other officials, but with a cordiality and evident pleasure that were highly gratifying to his guests.

The special electric cars which brought the party to the palace were in requisition again immediately after the reception and the remainder of the afternoon was spent in going to and at Guadalupe and its famous places of worship.

A reception and ball at the American Club ended the fourth day in the City of Mexico. The club room was turned into a bower of flowers and other decorations, and a new floor had been laid and covered for those who desired to dance. So enjoyable did this entertainment prove that scarcely half of the visitors felt able to arise in time on Wednesday morning to take the special train on the Hidalgo & Northern Railway for a visit to the great canal and tunnel recently completed, and which drains the valley in which the city stands. Those who did go pronounced the day one of the most interesting and enjoyable yet spent. From the city to San Cristobal, where the railroad crosses the canal, they were the guests of Sr. Gabriel Mancera, owner of the road. At San Cristobal they were taken in charge by Sr. Luis Espinosa, chief engineer of the contracting company which constructed the works. They were transported over the construction railroad along the banks of the canal to where the canal enters the tunnel, which for a distance of a little more than 10 kilometers continues the drainage system until it enters another canal and finally discharges into the River Tula, a tributary of the Panuca, which empties into the Gulf of Mexico. The vastness of this great engineering enterprise is little appreciated by the world in general. It was a stupendous undertaking and the success with which it has been accomplished is the crowning glory of Mexico's modern history. From an engineering point of view the excursion to the canal and tunnel was the most interesting event of the trip up to that time. And the social side of the occasion was not neglected. A Mexican breakfast, according to the programme, was to be eaten at Zumpango, but as it was half past two in the afternoon before that town was reached a luncheon was served en route. The breakfast at Zumpango was practically an afternoon banquet provided by the local committee. The table was beautifully decorated with flowers, and one unique feature was a series of large glass jars of the national beverage, pulque, in the national colors of red, white and green. The coloring and flavoring effects were produced by the juice of the prickly pear for the red, celery for the green, and almond for the white. The menu consisted of Mexican dishes which were so nicely prepared that it did not require any extra appetites to make the guests appreciate their quality.



AQUEDUCT AT PLAZA DE TOROS, ZACATECAS.

This excursion occupied the entire day. The start was made from the City of Mexico shortly after 8 o'clock in the morning and it was after 7

o'clock when the city was reached in the evening. No one regretted the length of time occupied by the trip. The only inconvenience experienced was in the short time allowed for the change of dress necessary to permit the party to attend a musical reception and tea tendered by the business men of the city at the Chapultepec restaurant which is located just at the base of the volcanic mound surmounted by the palace of President Diaz.

Thursday, November 14, was given up to an all-day excursion over the Gran Pacifico Railway to Cuernavaca. The principal features of this trip were the gorgeous scenery en route and the luncheon served at the two principal hotels of the old city. The route lay along the bases of the two snow capped giants, Ixticcihuatl and Popocatepetl, and presented a view of some of the grandest scenery in America. It was about 9 o'clock at night when the special train for this trip returned to the city. Three hours later the party took a regretted departure from the city where it had been entertained so delightfully during its five days' stay.

THE RETURN TRIP.

Early on Friday morning the two trains arrived at Pachuca. At 7 o'clock the not over-rested excursionists were aroused from their slumbers by the music of a brass band which had accompanied the local committee to the station to greet them. With as much speed as possible, dressing and breakfast were concluded and the entire party left the trains to be welcomed at the depot entrance by their hosts of the next two days. The local delegation was headed by the mayor of the city, Sr. D. Rodolfo Munoz, who cordially greeted the visitors and extended the freedom of the city. Carriages, stages, hacks and other vehicles then conveyed the party to the Governor's palace where it was received by his excellency, the Governor. From the palace the party was driven to the Santa Gertrudis Mines in the mountains several miles from the city, where after those who desired to do so were taken underground for an inspection of the operations. Here, as in a number of places in Mexico, the timbering of mines is impossible, on account of the absence of all timber, and it is found necessary to protect all drifts and crosscuts, when not in solid rock, by masonry arches. The method employed here is exceedingly interesting and made more interesting by the cheapness with which it is done. Another interesting feature is the almost entire dependence upon manual labor, machinery and even horse-power being conspicuously absent. The hoists and pumps represent the entire mechanical installation. The operations are however, carried on on a large scale and with highly profitable results.

A banquet luncheon with the customary speeches was served in one of the large buildings connected with the plant, after which the visitors were driven to one of the large haciendas where the patio process, more or less familiar to all the readers of the JOURNAL, is practiced on a large scale. At 5 o'clock in the afternoon an open air concert was given in the Plaza de la Independencia. In the evening at 8 o'clock a technical session of the Institute was held in the hall of the State Legislature. The principal paper presented at this session was one on the Mining District of Pachuca, by Sr. Ezequiel Ordonez, sub-director of the Institute of Geology of Mexico.

At 8 o'clock on Saturday morning, November 16, carriages were ready at the railroad station in Pachuca, and shortly after that hour the start was made for a delightful ride of 12 miles up an excellent mountain road to the mining camp of Real del Monte. Here another opportunity was afforded to go underground and study the conditions and mining methods. After the visit to the mines the party was driven to a magnificent grove of oaks, which crowns the mountain top. In this country the lower hills are barren of all forest growth, but at elevations of between 8,000 and 9,000 feet, one enters suddenly into areas heavily timbered with live oaks and other overgreens. At the border of one of these groves crowning a high divide, between two valleys, the citizens of Pachuca had constructed a temporary dining pavilion, capable of seating about 700 guests. Large out-of-door kitchens had been built of brick and here a score or more of cooks prepared the Mexican dishes, for which the mountain air and exercise of the morning had furnished the proper appetites. The writer will not attempt either to name or describe the viands. They were truly Mexican, both in name and character, but it was not necessary to know what they were in order to do them justice. They were washed down (lixiviated, so to speak) with tricolored pulque and other liquids. With the champagne came the usual speech-making, which was characterized by brevity and good feeling. Mr. Olcott's address delivered, as usual, in Spanish, was full of appreciation of the hospitality and courtesies which had been showered upon the Institute. Toasts were drunk to the Mexican flag and to President Diaz, and the luncheon closed with three rousing American cheers for the hosts of Pachuca and Real del Monte. After the luncheon, dancing in the open air was indulged in for an hour or so, and at 5 o'clock the long cavalcade starting down the mountain for Pachuca. The return trip was made in about one-fourth the time required for the ascent, and the city was reached in good time, for departure was set for 6 o'clock. It is not reflecting the least upon the entertainment at other points to say that the day at Real del Monte was the most enjoyable one yet experienced. At each stop new surprises await the excursionists, and if it were possible to kill with kindness and hospitality, Mexico would be guilty. From all sides the welcoming hand is extended, from the highest officials to the lowliest peon. At every town the streets are lined with rows of the poorer classes, who look with curiosity and smiling faces at the visitors, who are in turn just as curious, and just as pleased. A description of the Mining District of Pachuca, by Sr. Ordonez, which was presented at the session on Friday evening, is published on another page of this issue.

MINERS' HUTS AT INDE, MEXICO.

Guadalajara, the capital of Jalisco, the richest State in the Republic, was reached on Sunday, September 17, shortly before noon, nearly three hours late. Although it was Sunday and the train so late on arriving, the visitors were met at the station by a special committee of the Society of Engineers, of Jalisco, headed by its vice-president, Sr. Ignacio Queveras. An address of welcome was delivered in Spanish by Sr. José S. Schiaffins, and replied to by Mr. Olcott. No regular program was arranged for the day, and after the brief ceremony of welcome the visitors were left to their own devices, an attention which was sincerely appreciated, as it enabled them to visit the churches, markets and other places of interest and investment. Every one returned to the train laden with baskets, pottery and other curious purchases. In the evening a grand concert was given on the plaza, in front of the Governor's palace.

At 9 o'clock on Monday morning, November 18, the members of the Institute and their guests were taken in charge by a committee of the Society of Engineers of Jalisco and escorted to the city Orphan Asylum, the inspection of which was much enjoyed by the party. From the Asylum the party was taken to the Cathedral and Government Palace, then by special cars to the narrow-gauge railroad, which conveyed them to Barranca de Oblatos. This is the favorite resort of the citizens of Guadalajara and it is justly so. It is on the edge of a cañon which in general effect reminds one of the famous Grand Cañon of the Colorado. It lacks only size and the wonderful coloring of the strata. Further up the cañon are the famous falls of Juatacatlan, which the engineers were unable to visit on account of the distance and the time necessary to cover it. The "breakfast," which was served on the veranda of the Oblatos restaurant overhanging the gorge, was the usual banquet of many courses of Mexican dishes washed down with mescal, cervesa and pulque. An address of welcome was given in English by Sr. Ambrosio Ulloa, secretary of the Society of Engineers of Jalisco, and was replied to by Mr. Olcott in Spanish. The fine military band of the State rendered the patriotic airs of the two countries during the entertainment. At 4 o'clock in the afternoon the party started on its return to the city, upon reaching which it was escorted through the American portion of the city. From 7 to 9 p. m. a special band concert was given in the Plaza de Armas in honor of the ladies who accompanied the engineers. The stay in Guadalajara was entirely given up to sightseeing, shopping and social diversions. The city is third in size in the republic and full of interest to the tourist, but there are no mining operations in the vicinity.

At 11 o'clock the trains pulled out of the quaint old town and made a good night's run to Guanajuato, where they arrived ahead of time at 8 o'clock, Tuesday morning.

When the two trains pulled into Marfil station, three miles from the city, they were met by a local committee, and the excursionists were taken in special street cars to the Guanajuato Club, where a short time was spent in making introductions

among the hosts and guests. These over, the visitors were again escorted to special cars and driven to the mine and works of the Guanajuato Consolidated Mining and Milling Company. This is one of the interesting old mines of this vicinity and has been worked for more than a century. The present opening is by the old tunnel, which penetrates the hill for 700 meters until it reaches the vein. The tunnel is then driven on the vein until its entire length amounts to 6,000 feet. Nearly all of the ore above the tunnel has been worked out, the present operations being almost entirely confined to the ore bodies below the tunnel. Attempts are here being made to supplant a part of the Peon labor by machinery, and two shafts are being driven on the incline of the vein (42°) from the tunnel. These inclines will be carried down 1,000 feet, and the hoists will be operated by electricity. It was rather a novel sight to the visitor to see the Peons climbing up ladders and steps cut in the footwalk carrying on their backs large sacks of ore. A tramway conveys the ore in cars from the tunnel along the edge of the hill to the mill about half a mile distant. The mill is equipped with a Blake crusher and 20 stamps; 40 additional stamps are being added.

After the mine had been carefully inspected, the party returned to the city and was taken to the State College for luncheon. From the nature of this entertainment it appeared that the fame of the previous ones had travelled ahead of the special trains, and the citizens of Guanajuato had determined to excel if possible the attempts made at other towns. It is not possible to make any comparisons. Every effort at the entertainment of the country's guests possesses some unique and delightful features different from the others and adds its special charm. The entertainment at Guanajuato was without formality, but perfect in its quality and service. As for the town itself it is as quaint as any place of similar size in Egypt. Narrow, crooked streets which follow the easiest grades for travel, sidewalks not wide enough for two abreast, and lining usually but one side of the street, heavily laden burros and donkeys sometimes challenging right of way with pedestrians —the whole scene except for the occasional modernly dressed individual being as one taken from the scriptures. One of the industries of the town is that of making brick which are sun-baked. The method employed is the same as that practised by the Children of Israel before they were deprived of the straw.

The afternoon of the first day in Guanajuato was occupied in visits to the Mineralogical and Zoological Museums and by a pleasure trip to the parks at La Presa. In the evening some of the principal buildings in the city were illuminated in honor of the visitors and the day ended with a reception at the Guanajuato Club. At this function the guests were instructed to come in ordinary dress, a courtesy which was highly appreciated, and added to the pleasure of the occasion.

The morning of the second day in Guanajuato, Wednesday, November 20, was spent by the men of the party in a visit to the mines on the Veta Madre, or mother lode, of this region. Cavalry horses were provided for their transportation, and at 8 o'clock a considerable cavalcade left the Esperanza reservoir for the ride over the mountains. The ladies were left free to visit the catacombs, one of the curiosities of this city, the American Hospital and other of the many interesting places in the city. At 1 o'clock the entire party rendezvoused at the State College, where another delightful luncheon was served, while the State Military Band rendered fine music.

A visit was then paid to the historical Granaditas building and to the Flores Patio Reduction Works. This ended the program of entertainment at Guanajuato. Promptly at 5 o'clock the two trains pulled out for Aguas Calientes, which was reached during the night. The two days spent in Guanajuato were among the most interesting of the entire trip, and it was with sincere regret that the visitors bade their hosts good-bye.

Aguas Calientes was reached during the night, and as there was nothing on the program here until 9 o'clock, the rather tired excursionists had a good night's rest. At 9 o'clock a committee of citizens, headed by Messrs. O. L. Westland, Roberto Brendel and Henry Rab, presented themselves at the station, and after informal introductions, escorted the visitors in special cars to the palace, where they were received by Governor Sagreda, after which the party was taken to the smelting plant of the American Smelting and Refining Company, which is the principal industry of this city. Aguas Calientes is a central point to which the smelting ores from Parral, Chihuahua, Ameca, Pachuca and other mining districts in the Republic are sent for reduction. The works at present are undergoing extensive alterations under the supervision of Mr. Cyrus W. Robinson, chief engineer for the company. These alterations, which will cost about $650,000 in gold will be finished about next June. In the meantime no interruption to the operations of the plant has been caused. From 1,100 to

MINA VIEJA, SANTA EULALIA, NEAR CHIHUAHUA.

1,200 tons of copper and silver, lead ores and concentrates are being smelted daily. The product, which, of course, varies in quantity according to the contents of the ores treated, consists of blister copper and base bullion (silver-lead), which are shipped to Perth Amboy, N. J., for refining. When the alterations are completed, the capacity of the plant will not only be largely increased, but many economies of operation will be effected, and a great saving made in the condensing of the furnaces gases, which at present carry off a considerable value. The plant will then be a strictly up-to-date establishment, with electrical equipment throughout and equal to anything of the kind in the United States. Even now it stands out in striking contrast to the mining methods employed in Mexico generally, where nearly all of the labor is performed by peons and where mechanical installation is at a minimum. After the smelting plant, assay offices, etc., had been visited, the party was entertained at luncheon in the mess-hall of the company's officials. Returning to the city, most of the excursionists were glad to avail themselves of the excellent baths the palace affords. In the afternoon at 4 o'clock a grand band concert was given in the San Marcas Garden, and from 8 until 11 in the evening another musical program was rendered in the Plaza de la Constitution. At midnight the trains left Aguas Calientes for San Luis Potosi.

BY TELEGRAPH

Our despatches published last week followed the returning trip of the Institute up to the time of their departure from Guanajuato on the afternoon of November 20. The special train left Guanajuato at 5 p. m., and arrived at Aguas Calientes at midnight, the members remaining in the cars until morning. At 9 o'clock in the morning the reception committee extended a formal welcome to the visitors, who were conducted to the Palace, where they were specially received by Governor Sagredo, short addresses being made and formal greetings exchanged. The welcome here was fully as hearty as at other points on the trip. After this ceremony special cars were provided to convey the members to the works of the American Smelting and Refining Company—formerly known as the Guggenheim plant. After the extensive plant had been carefully inspected, and its many excellent points noted, lunch was served, and at the conclusion of this the visitors returned to the city. In the afternoon a grand concert was given in the honor of the Institute at the San Marcos Garden, and in the evening another concert on the Plaza de la Constitution. The stay at this point was generally enjoyed and regrets were expressed when the train left Aguas Calientes at midnight.

The Institute party reached San Luis Potosi on the morning of Friday, November 22, and were received by a committee headed by Mr. A. S. Dwight, which was awaiting their arrival at the station. The members were again greeted by music as the train reached the station. The reception here consisted of a formal greeting, tendered by Governor Escontria, whose reception had been arranged for 9 o'clock. At 10 a. m. the visitors started on a special train for the works of the Compania Metalurgica Mexicana, and considerable time was spent in inspecting the smelting plant at this point. Some of the party extended their trip to the dam of the city water works, which is an interesting structure from an engineering point of view. At the smelter a luncheon was served to the party on the lawn, after which return was made to the city, the afternoon being spent in visits to many points of interest in the vicinity. In the evening the visitors were serenaded by two bands on the Plaza de Armas, and a number of them attended an informal ball at the Potosina Club, where nearly all the prominent citizens were present. This was, much to the regret of the members, cut short by the early departure of the train, which was scheduled for 10 o'clock. The visit to this point was certainly full of interest, and was extremely pleasant and instructive to the members. They unanimously agreed that the smelting works visited during the day were models of good arrangement and careful management, and that they could be studied to great advantage by engineers and metallurgists. The train conveying the party arrived at Tampico at 2 a. m. on the morning of November 23.

With our fuller report of the technical sessions held we publish this week a number of reproductions from photographs showing points of interest to which visits were made in the course of the trip, and these will serve to illustrate the variety of interests presented to the members on their journey.

THE RECEPTION AT CHIHUAHUA

In the telegraphic account published in the JOURNAL of November 9, we outlined the trip of the Mining Engineers on their first start from New York. To add some further particulars received by mail, which may be of interest, we may state that the party consisting of about 160 persons, including ladies, who accompanied the members, were conveyed in two trains furnished by the Pullman company, and said to be the finest ever made up for so long a run. The first train, or section, consisted of two baggage cars, a dining car, a compartment car, two drawing room cars, an observation car and the private car *Olympia*. The second train was made up of two baggage cars, a dining car, two compartment cars, two drawing-room cars, an observation car and a private car for Dr. James Douglas, president of the Copper Queen Company, of Arizona. It must be remembered that with the exception of the time spent in the City of Mexico, these cars practically constituted the home of the party during the trip, since, in a number of places visited there were no adequate facilities for so large a party.

Our despatches outlined the trip as far as Chihuahua, which was the first point of importance to be visited on the outward trip. There had been some delay and the trains reached the city rather late, but in spite of this, the preparations for the reception were not disconcerted. The station was crowded with applauding people and carriages were provided in which the visitors were conveyed to the Governor's palace, where they were formally received by Governor Ahumada, who is now serving his third term in that office. He welcomed the engineers in a graceful speech, to which President Olcott, of the Institute, responded in Spanish. In the evening, after this ceremony, the visitors were entertained by a ball given in the Teatro de los Heroes, a very handsome structure built by the State. Supper was served on the stage and was composed largely of Mexican dishes. Next morning was given over to visits to various points of interest in the city and vicinity, for which carriages were provided. In the afternoon, a *Corrida de Toros* was given in honor of the visitors. In the evening the band of the School of Arts gave a concert on the plaza, which had been elaborately decorated for the occasion, flags being freely used while the whole front of the Cathedral, which faces on the Plaza, was brilliantly illuminated. The small plaza in front of the Palace was also elaborately decorated and illuminated. The center of this plaza is occupied by the famous statue of Hidalgo.

Chihuahua is known as one of the most enterprising towns in Mexico, having several important industries of its own and being a commercial center for a large mining territory. The streets are well paved and lighted, and there is an excellent water supply system. Among the important industries is the plant of La Compania Industrial Mexicana, which is under the active management of Juan A. and Henrique C. Creel, brothers, who took hold of the concern eight years ago, when it was only a small foundry and machine shop. The plant now includes a 15-ton basic open-hearth steel furnace, a steel casting plant, a rolling mill, a large machine shop and a large iron foundry, all in active operation. The tools and machinery are entirely of American make and the plant turns out a variety of mining and other machinery, including corliss engines of large sizes. There is also a well-equipped brass foundry, a special department for the manufacture of valves, pipe fittings, etc., the only one of the kind in Mexico. About 550 men are employed, of whom some 500 are Mexicans. Eight years ago the latter were employed only as common laborers, but now many of them are skilled machinists, rollers and steel workers. At present the pig iron used here is brought from the United States, but the company uses a large quantity of old car wheels and other scrap purchased from the railroad companies. The fuel used is wood and coal, the latter costing from $12 to $18 (Mexican) per ton. Plans are being drawn for a very large new machine shop as an addition to the works. The company is now erecting a new electric plant, the building for which is being put up by the American Bridge Company, and is large enough to contain a plant of 10,000 h. p. Sr. Creel recently added to his enterprise a copper mining property near Chihuahua, which was formerly worked by an English company, but abandoned. The new concern, which is known as the Rio Tinto Mexicana, is now working with excellent prospects of success. Nearly $100,000 (Mexican) have been expended in machinery and development work.

From Chihuahua, the next important point reached was Parral, and the hearty reception given the party at that point was fully described in our correspondence published last week.

LA DESCUBRIDORA MINE, CHIHUAHUA, MEX.

EDITORIAL CORRESPONDENCE.

The stop of the American Institute of Mining Engineers in Chihuahua was necessarily so brief that it was not possible to take the party to the Santa Eulalia District, although that was one place that many of the members desired most to visit. A very agreeable substitute for this visit, however, was the trip to the mines of La Descubridora Mining Company, which are located about six miles north of the city of Chihuahua. Most of the mines of Mexico are famous for the many years that they have been operated. Nearly all of the mines visited by the engineers' party have produced gold or silver, or both, off and on for two or three centuries. La Descubridora is not in that class of mines, but it is none the less deserving of a place in history. It is only three years old, but is said to have paid over $400,000 in dividends on an original investment of $100. The expenses of perfecting title to the original claim were paid by the first wagon load of ore sent to the smelter. The ore is a mixture of silica and lime carrying silver, gold, manganese and a little iron. The average of shipments show: Silver, 12 ounces; gold, 0.3 ounce; carbonate of lime, 35 per cent; manganese, 18 per cent; silica, 15 to 20 per cent; iron, 3 per cent. The ore does not contain any copper, lead, zinc or antimony. This makes a very desirable ore for fluxing and is in good demand at the smelters. Shipments are at present from 3,000 to 4,000 tons monthly. It is expected that this will be doubled in a few months as soon as some new smelters now in course of construction are ready to take the ore.

The method of attacking the ore is very simple, and consists of open cut mining or quarrying. There is no appearance of vein structure, and as yet little prospecting has been done to determine the extent of the ore body which appears to form a large part of the hill on which the mine is located. Two tunnels have been driven running west from the open cut workings. The tunnels are each about 300 feet long and connected by crosscuts 100 feet apart, all being in pay ore. A prospect shaft 100 feet deep shows the ore to that depth.

The open cut is worked by benches very little overburden having to be removed at the beginning.

The ore is loaded into wagons from where it is blown down by the blast. The total cost of mining the ore is 40 cents Mexican (less than 19 cents American) currency per metric ton. Hauling to the railroad (6 miles) costs $1.75 Mexican. Railroad freights and smelter charges bring the total costs up to $5 per ton in gold. The proceeds in precious metals will average about $12 reduced to gold values. The property contains 25 claims of 100 square meters each. It is owned by La Descubridora Mining Company of Chihuahua, J. G. Follansbee, president, and W. H. Kraft, manager.

SOME PRINCIPLES CONTROLLING THE DEPOSITION OF ORES*

By C. R. Van Hise.

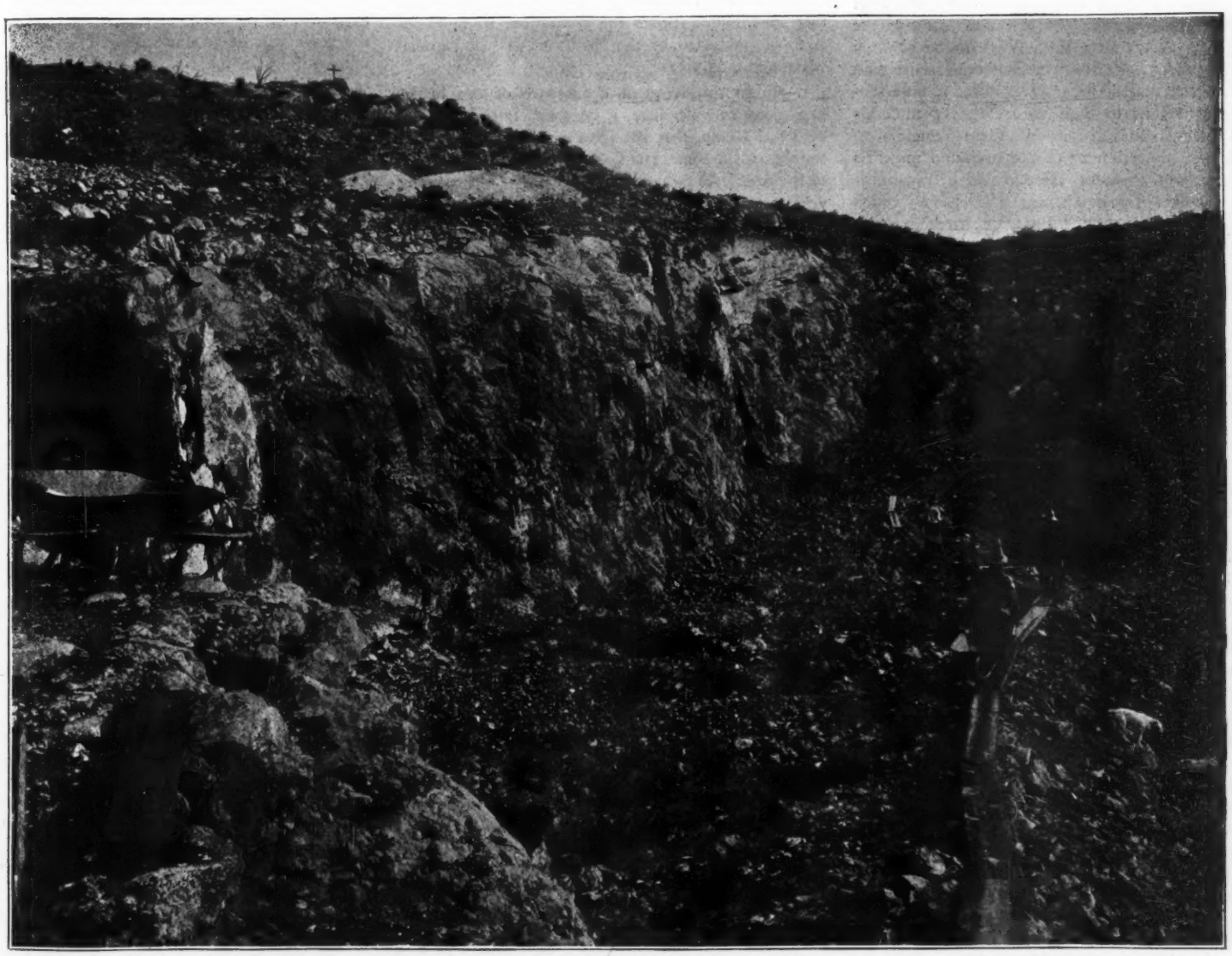
This paper is intended as the closing reply to comments on the author's previous papers on the same subject. It appears that, so far as the classes of ore-deposits are concerned, there is no difference of opinion between myself and Prof. Vogt and Dr. Lindgren. We all agree that the class of contact deposits exists; that the source of the ores of such deposits is largely the igneous rocks; and that during the concentration of the ores a high temperature prevailed. The difference of opinion occurs in the interpretation of particular cases. Prof. Vogt and Dr. Lindgren, but more especially the former, hold that many ore-deposits, including sulphides, are more closely allied to the igneous rocks than to water-deposits; while I hold that the majority of ores, as shown by their character and relations, are deposited by underground waters. However, I have distinctly recognized that there may be deposits in which it is difficult to say which of these two agencies predominate.

But in the vast majority of cases there is little difficulty in discriminating between veins and dikes—the first representing crystallizations from water solutions; the second, crystallization from magma. There are few cases where the discrimination with reference to ore-deposits is not easy. While gradations between water deposited ores and igneous ores are uncommon, gradations between the different classes of ore deposits formed by underground water are common.

Concerning pneumatolitic action as an auxiliary in the formation of ores, as held by Vogt, Lindgren, Beck and Kemp, I do not deny the existence of ores of this class, but simply say that, while ore-deposits produced by this process are theoretically possible, and very likely exist, I do not know of any instance in which it has been shown that pneumatolitic action has actually been a dominating factor in the production of a workable ore-deposit. However, I think it not unlikely that pneumatolitic action (in the sense of water gas under very high pressure, above the critical temperature of water) may have helped in the segregation of the metals by transporting them to the main channels of water circulation. This condition of the water I distinctly recognize as producible not only by igneous rocks, but also by dynamic action. But discrimination should be made between what may be true and what has been shown to be true. The presence of such so-called contact minerals as tourmaline and fluorite, holding such elements as boron and fluorine, is not proof that they and the other minerals in the veins containing them were not deposited by heated circulating waters.

From the proposition that igneous rocks are an important source of the ores, and that the ores are extracted from them by circulating waters, it by no means necessarily follows that this work is chiefly done while the rock is a fused liquid mass. After the rocks crystallize and become partly cooled, deformation, and the cooling itself, may produce many fractures in them, thus furnishing channels through which the hot waters course while they are collecting the metals. In this manner is largely explained the difficulty under which Prof. Kemp labors in understanding how circulating waters may work upon hot igneous rocks. So far as igneous rocks are deep-seated intrusives, they may retain after crystallization a very large part of the water which they previously held. This is evidenced by the innumerable liquid inclusions in many such rocks.

In this connection I may say that, among the papers presented in this discussion, Lindgren's admirable paper upon metasomatic processes in fissure veins seems to me wholly to confirm the view that the deposition of most metallic deposits is effected by underground water. The metasomatic changes in the rocks which Dr. Lindgren describes, occur not only in the veins themselves, but in the walls of the veins. Moreover, in many cases the amount of change decreases in passing from the walls into the veins. During the metasomatic changes, metals were added and subtracted. Lindgren declares that, in the great majority of these cases, the chief agents through which the metasomatic changes were accomplished were circulating waters. He concludes, further, that the waters were probably hot; that those which originally deposited the sulphide constituents were probably ascending; but that the ascending waters are chiefly of surface origin. There-



LA DESCUBRIDORA MINE, CHIHUAHUA.

*Abstract of paper read before the American Institute of Mining Engineers, Mexican meeting.

fore, in all these matters, by his exhaustive study of the metasomatic processes in the veins, Dr. Lindgren fully confirms my most fundamental contentions.

It is noteworthy that Prof. Vogt and Dr. Lindgren, with admirable scientific restraint, notwithstanding the beliefs which they hold, discriminate clearly between the few cases in which they have shown a probability that the ores are the products of igneous action and the far more numerous cases in which the evidence of such origin is very scanty or wanting altogether.

Thus Prof. Vogt recognizes clearly that the attribution of the larger class of these ores to igneous action is purely hypothetical. He fully appreciates that, of the great majority of ore-deposits, he has wholly failed to show that igneous agencies have separated the ores from the original rocks and placed them in their present positions. This connection must be made before the hypothesis advanced by Prof. Vogt can hope for acceptance. Since the majority of the ore-deposits thought by Prof. Vogt to be possibly due to "contact after action" in some other sense than segregation by underground water differ in no essential particulars as to their character, the minerals they contain, the relations of these minerals to one another, the relations of the ores and minerals to the surrounding rocks, the presence of crustification, and other features, from ore-deposits which many authorities, including Prof. Vogt, recognize as deposited by underground water, I shall hold to the old view that they are the results of water deposition until evidence is presented showing the contrary. To attempt to prove the proposition that these ores are deposited by water would require the repetition throughout of the arguments for such an origin which have been presented during the past half century by nearly all of the famous men who have discussed ore-deposits. If these arguments are not adequate to convince the reader, I cannot, in closing this discussion, present the case more fully, but must defer the matter until the publication of my treatise upon Metamorphism, in which I consider much more fully the circulation and work of underground water, and the character of the deposits produced by that agent.

If it be recognized that, in the majority of the cases cited by Vogt and Lindgren, the materials of the ores were transported and deposited in their present positions by underground waters, it makes no difference to me whether such ore-deposits be called contact-deposits, hydro-thermal deposits, dynamic metamorphic deposits, or regional metamorphic deposits, as proposed by Lindgren.

Dynamic action may increase the temperature of the underground waters, and make the conditions much more favorable for the deposition of ores. If in the first part of my paper, discussing general principles, I have not made clear my belief in the extreme efficiency of hot water, as compared with that of cold water, in the segregation of ores, I have failed altogether to convey my ideas. I fully recognize the remarkable relative potency of hot water in all classes of alterations of rocks, including the deposition of ores. I emphasize especially the effect of high temperature, (1) producing a deeper circulation, (2) in producing a more rapid circulation, and (3) in very greatly increasing the power of water to do chemical work of all kinds.

Further, I strongly make the point that both the speed of solution and the amount of material which may be taken into solution are greatly increased by high temperature, and in proof of the efficacy of hot water in the production of ore deposits, I cite the Cordilleran region of the West as one in which the temperature of the water is higher than normal, and in which ore deposits are common.

In conclusion as to this portion of the discussion, I would say that, while I think I have given adequate weight to igneous rocks as a source of the ores, and to the resultant hot waters as an agency in their concentration, I have not elaborated that branch of the subject. The reason is, that these ideas are not new, but have been generally accepted for decades by all who have written upon ore-deposits. A complete treatise upon ore-deposits should, of course, give proportional representation to all parts of the subject; but a paper on the subject necessarily covers the new ground most fully; and if, in addition to this, it puts new material in its proper relations and proportions to old material, that is all that can be fairly expected.

I have reserved for separate consideration most of the points raised in Prof. Kemp's paper upon "The Rôle of the Igneous Rocks in the Formation of Veins," with the arguments and conclusions of which I am not in such general agreement as with those of the other papers named. I shall state the points both of agreement and of difference between us; and, I need hardly say, with entire personal esteem and respect for Prof. Kemp. But my position is rendered somewhat embarrassing by the circumstances that this contribution closes the discussion, so far as it is to be published by the Institute in the special volume now in press.

1. From the frequent occurrence of ore bodies in regions of vulcanism, it does not follow, as held by Prof. Kemp, that the igneous rocks are the sole source, or, in some cases, even an important source of the ores. As pointed out by Prof. Le Conte many years ago, and as shown by me, "the undoubted occurrence of workable ore-deposits in regions of vulcanism may be explained by that heat furnished by the igneous rocks, this promoting the work of the underground solution." I have already emphasized the enormously increased activity of solutions with rise of temperature. In the neighborhood of igneous rocks the underground solutions are hot, and these hot solutions may, and in many cases, I believe, undoubtedly do, derive a large part of their metallic material from the sedimentary or metamorphosed rocks, although, as indicated in my original paper, I maintain that probably the ultimate source of all the ores, and very frequently the chief or sole immediate source, has been the igneous rocks.

2. While Prof. Kemp would derive the majority of ores from igneous rocks, he declares that surface flows of such rocks are unfavorable to vein formation. But, to give a single instance to the contrary, the Lake Superior copper deposits were shown by Pumpelly, years ago, to occur in or associated with surface volcanic rocks. I think the true statement is, that very recent volcanic flows have not had time enough for the development of contained or connected ore deposits; or else, they have not been eroded deeply enough to expose such deposits, if they exist. But it would be rash to say that ore-deposits are not even now forming in the middle and lower parts of the great lava flows of the plateaus of the West. Indeed, I think it highly probable that such formations are going on, and that at some future period the resulting ore-deposits will be at the surface.

3. In asserting the existence of gradations between pegmatite and quartz veins, I am glad to find Prof. Kemp in full accord with me. I pointed out such gradations some years ago, and, as already explained, advanced as the explanation that water and rock, at sufficiently high temperatures and pressures, are miscible in all proportions.

4. From Prof. Kemp's statement that "practically all students of volcanic phenomena are agreed that steam and its dissociated representatives in the molten rocks are the chief, if not the only, cause of eruption," I must wholly dissent, holding with Dutton and Gilbert that, in areas of regional vulcanism (which are those containing the most extensive ore deposits), gravitative stress is the dominant force producing eruption, although it is agreed that steam plays a subordinate part, and an important part in local vulcanism.

5. Perhaps I do not fully appreciate Prof. Kemp's arguments concerning capillary attraction as connected with the movements of underground water. Prof. Kemp says that the imperviousness of strata is partly due to the "feebleness or disappearance of capillary attraction with increase of pressure." Later he says: "Whenever, for example, capillary transmission occurs, the previously acquired head is lost, and the emerging water proceeds on its way only under a newly accumulating head." Further, he says that "capillary attraction is largely an ascensive force." I am uncertain whether or not Prof. Kemp intends to imply that I have advocated the view that capillarity is an important force, which accounts for the circulation of groundwater in the belt of saturation. As a matter of fact, I have not appealed to the force of capillarity in any way whatever to explain the circulation in this belt. It seems to me that Prof. Kemp has wholly failed to recognize the great difference in the nature and forces which control the circulation of water in the belt of weathering, above the level of ground water, and the belt of cementation, below that level. Above the level of groundwater the force of capillarity is important in the movement of groundwater. This matter I shall discuss fully in my treatise on Metamorphism, but cannot take up here, as it is a complicated one. Below the level of groundwater, the size of the openings, as I have fully explained, is of very great importance in the movement of the underground water, because friction runs up very rapidly with subdivision of the openings; but how capillarity is a "descensive" or "ascensive" force in this belt, I am at a loss to understand.

6. Prof. Kemp does an unintentional injustice when he cites me as supporting "the views that hot springs are the result of normal terrestrial circulations, without accessions of heat other than those which would be received through the ordinary increase of temperature with depth." I refer the increase of temperature of the underground waters to the normal increase of temperature with depth, to vulcanism, and to dynamic action. Regional vulcanism and orogenic movements I mention twice as producing high temperature.

7. But I held, and still hold, that difference in temperature of the ascending and descending columns is a cause which works in the promotion of circulation as an adjunct to the main cause, head. Prof. Kemp argues against this conclusion, but his argument seems to me to be unsound, for the following reasons: *a.* Since I emphasize vulcanism and orogenic movements as chief causes of high temperature in underground water, the depth, and therefore the pressure, may be but a small fraction of that assumed by Prof. Kemp. *b.* The only experiments which I have found upon the compressibility of water at high temperature are those of Barrus, in which he finds that the compression resulting from the pressure cited by Kemp is much less than would be necessary to neutralize the expansion due to the heat mentioned. *c.* Admitting for the moment that the pressure does neutralize the expansion due to heat, since the pressure is nearly the same upon both the ascending and descending columns, and inasmuch as, under the hypothesis, there is a difference in temperature between the two columns, there would be a a difference in density, and therefore a cause for flowage.

8. Upon another point connected with the circulation of underground water, Prof. Kemp says: "We must bear in mind also that the standing body of cold groundwater fills the interstices of all rocks, except those in very arid regions, and exerts a retarding influence on uprising currents." I am entirely at a loss to understand how the coldness of the water prevents circulation due to difference in head and difference in temperature of the two columns, except as to an effect which I have emphasized, namely, that due to varying viscosity.

I, of course, maintain that the heat energy of the igneous rocks passes into and thereby expands the water, thus causing a difference in density between the ascending and descending columns, and thereby promoting circulation. But Prof. Kemp has thrown this use of the energy act in producing a circulation,

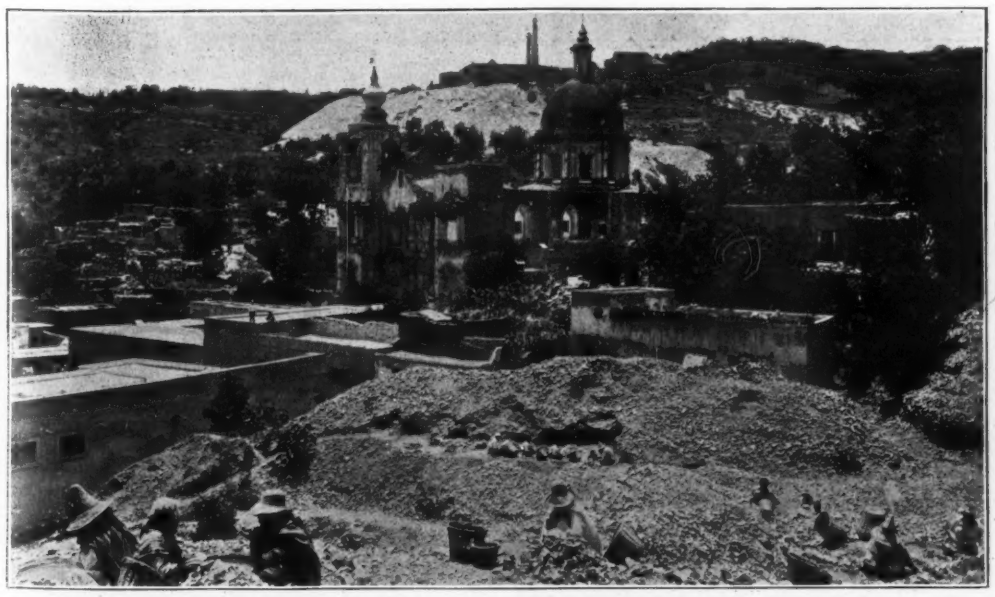
unless it be by heating and thereby expanding the water, he does not explain.

9. Prof. Kemp says that "standing water in abandoned shafts is strong evidence of the impenetrability of rocks." This seems to me untenable. Such standing water has come in either from the surface, or through the "impenetrable rocks." The latter hypothesis Prof. Kemp rejects. But if the former be true, why does not the water rise with periodic additions? According to my view, standing water in shafts, exactly as in wells, indicates the upper limit of the belt of saturation. But the standing water maintains its uniform level (in the absence of pumping) by flowage through the rocks, compensating the local additions or subtractions. Certainly the water standing in the wells of the drift covered regions of North America does not prove that there is no active underground circulation in the drift.

Passing from specific points concerning the circulation of underground water, I, of course, largely dissent from Prof. Kemp's general view upon this subject, and can only refer to the argument already given in my paper. If the evidence there presented, showing that the main source of the underground water depositing the ores is meteoric, and not derived from the igneous rocks, as held by Prof. Kemp, does not prove the point, it is useless further to discuss the matter here. In my treatise on Metamorphism I shall cover this part of the subject much more exhaustively. While I hold that the main source of the water depositing ores is meteoric, I recognize that another source of such water is the igneous rocks.

While I have never advocated a universal uniform underground circulation, as implied by Prof. Kemp, I have held, and still hold, that the amount of underground water and its circulation is much more general than he believes. This problem may be considered, first, from the point of view of the amount of underground water now present; and second, and more important, the amount of work which has been done by underground water.

Upon the first point, it is contended by Prof. Kemp that the amount of underground water in the belt of saturation is usually small; but in opposition to this view we have the general experience of mining men and of those who by wells seek underground water.



SORTING OLD DUMPS, MINA DE LA CITA, GUANAJUATO.

While there are notable exceptions, it is in general a difficult and expensive process to lower artificially the level of groundwater which is generally found in both humid and arid regions, though at greater depth in the latter. In the lead and zinc districts of Missouri, this operation, called by the miners "beating the water," is usually attempted only by a number of companies, acting jointly, and constitutes the most formidable part of mining work.

In Wisconsin, it is a grave hindrance to mining below water level. The lowering of the groundwater by, say, 50 feet, is an exceedingly difficult task, involving enormous expenses for pumping. The subsequent holding of the water at a given level is much easier, as Prof. Kemp has noted. But my conclusions from these facts are that, in the belt of saturation, the openings are large and the quantity of water is great, but the circulation is, in most cases, not too rapid to be controlled by pumps of moderate capacity—although, in some cases, to hold the water at a given level involves the handling of vast quantities of underground water.

In this connection Prof. Kemp remarks that the circulation at smaller depths than 1,500 or 2,000 feet has no bearing on the question of ore-deposition. While a few ore-deposits have been profitably worked to a greater depth than this, it is well known that probably more than 90 per cent of the metallic wealth of the earth yet mined has come from above the 2,000 ft. level; and therefore there is no warrant for the statement that the circulation above this level is not of vital importance in the production of ore-deposits.

In this matter of depth, Prof. Kemp asserts of the general circulation of underground water, that "something like 2,000 feet appears to be its limit;" but the only evidence which he presents upon this point is that in some cases this is the fact. The local instances cited are not proof of such a law. On the other hand, the evidence which I have presented to the contrary is reinforced by the arguments of Prof. Vogt, which, combining the facts of observed depth of denudation of veins with the likeness of their deeper parts to those parts nearer the surface plainly produced by underground waters, clearly lead to the conclusion that, in many cases, the underground circulation must have been efficient to a depth several times greater than 2,000 feet.

On the second point, the work of underground water, Prof. Kemp declares that veins are the exceptional, not the general, work of this agency. He says that while veins occur locally in mining districts, there is a "general absence of veins." If Prof. Kemp means mineral veins, this is of course true; but if he means literally what he says (and it is only with this meaning that any argument can be made as to the circulation of underground water), I wholly dissent from the conclusion. In my field-work throughout the United States and considerable areas of Canada I have yet to find a district in which a series of rocks has been in the belt of saturation for a long time geologically in which there are not extensive metasomatic changes in the rocks, and many veins.

While I have never advocated a universal, uniform, vigorous underground circulation, as implied by Prof. Kemp, I have held and still hold that, almost universally, in those places where ore-deposits occur, a vigorous circulation was going on during the time the ores were deposited; and at the only places of which I know where ore-deposits are now forming, such a circulation is going on. The fact that some areas in which ore-deposits are now worked do not now show a vigorous circulation has no bearing upon

PARTY OF ENGINEERS IN THE 700-FT. LEVEL, EL BOTE, NEAR ZACATECAS.

the question of the deposition of these ores by underground water. The very process of vigorous circulation by underground water results in the cementation of the openings, as I have fully explained. In so far as the innumerable openings are filled, and during the process here and there ore-deposits are formed, just to that extent the openings are closed. When the openings have been filled to such an extent that they become subcapillary, circulation practically ceases for the time. But subsequent earth-movements or igneous intrusions may again produce openings in the rocks, and thus a new circulation may be set up. Of course it is well known that in the deep copper deposits of the Lake Superior region, and at various other localities, as at Przibram, there is not now a vigorous underground circulation. I cannot believe that Prof. Kemp therefore dissents from the conclusions of Pumpelly, Irving, and others, that in the Lake Superior region the deposits of copper in the openings of the conglomerates and amygdaloids, extending to a depth of 5,000 feet, or more, are the cementation result of circulating underground waters. Posepny realized full well that when the ore-deposits were formed at Przibram, there was a vigorous circulation of underground waters at a depth below 1,100 meters. With regard to the formation of the deep deposits of Lake Superior, Przibram, and many other localities in all parts of the world, cited by Posepny, in some of which there is now but a feeble circulation, I am but a follower of Sandberger and Posepny and nearly all the eminent geologists who have written upon ore-deposits, in the belief that these ores were put in place by underground waters. In whatever respects I may differ from Sandberger or Posepny, there is absolute identity in our fundamental contention that the great majority of the metallic ores, to the greatest depth penetrated by man, were deposited in the places where they now exist by circulating underground waters.

The localization of ore-deposits, of which Prof. Kemp speaks, I have shown to be due to the fact that each case of the formation of a deposit "re-

quires the fortunate combination of many favorable factors working harmoniously together, the absence of any one of which may prevent the concentration of the ore-deposit." Only here and there have existed the remarkable combination of circumstances necessary to form an ore-deposit, and thus once in a million times, or once in ten million times, a vein formed carries a sufficient amount of the valuable metals to be an ore.

Therefore, notwithstanding the contrary belief of Prof. Kemp, I again assert that the deposition of the great majority of ore-deposits—namely, those produced by underground water—is a special case of the general work of underground water, which can only be adequately explained by a profound knowledge of the facts and principles controlling the circulation and work of underground water, and a detailed knowledge of the special modifications necessary to explain the localization and relation of the ores.

SORTING YARD AT CUBO MINE, GUANAJUATO.

SOME NOTES ON GUANAJUATO

The Esperanza Reservoir was built on the upper reach of the Esperanza Creek. It is to impound the water for the domestic supply of the City of Guanajuato, while the two dams on the Olla, visited by the mining engineers, serve to equalize the supply for irrigation.

The Esperanza dam is a rubble masonry structure with a straight crest of 166 meters in length by 6 meters wide. The maximum height of the dam is 34 meters; the thickness at the base is 23 meters for the main dam, but against the down stream face are three square buttresses each 3 meters square, placed primarily as ornaments, although somewhat increasing the strength of the structure. The cubic contents of the masonry is 42,000 cubic meters laid in place at a total cost of $160,000 (Mexican). The spillway is built through the south end of the dam and as an artificial channel, so that the water cannot reach the face of the main structure; its capacity is 50 cubic meters per second. The drainage area above the dam is 17,000,000 square meters; the annual rainfall is 0.6 meter, falling in three months with a maximum estimated at 0.06 meter per hour for one and one-half hours. The reservoir impounds 2,000,000 cubic meters in a surface area of 187,000 square meters.

The water is drawn from a vertical water tower consisting of a cast-iron pipe 0.4 meter in diameter having seven gates at seven different levels, each controlled by a separate hand-wheel mounted on a platform at the level of the crest of the dam. The ordinary water level is 280 meters above the city datum.

The water is filtered after being drawn from the reservoir by upward passage through 1 meter of river sand in a circular filter chamber 40 meters in diameter, with a capacity of 5,000 cubic meters per 24 hours, although the present daily consumption is 3,000 to 4,000 cubic meters.

The mines of Guanajuato were discovered, like the manufacture of glass, by the fusing of the stones in the camp fire of a passing pack train. In 1547 there was a regular line of carts hauling supplies from Mexico to Zacatecas, and bringing back ore. This camp fire located the first Guanajuato mine at La Luz, on the southeast series of the Mother Lode system. This system includes three distinct series of fissures nearly parallel and separated by somewhat barren ground. The strike is northeast, the dip 45° northwest. A number of interesting fissures connect the three series.

The vein filling is quartz, so brecciated that it is best to call them fracture planes. The ore is a simple sulphide. The extreme width of the vein is about 300 feet. The hanging wall is diorite, the foot wall schist.

The Rayas Mine was opened in 1557. The Valencia was opened in 1760, but did not pay until 1768, since which date its output has exceeded $300,000,000. The principal Valencia shaft is 1,686 feet deep, vertically, the inclines from it bringing the total depth to over 2,000 feet, at which depth it was left in ore worth $40 per ton. Five other principal shafts are vertical and have depths varying from 550 feet to 1,200 feet. Water and deficient methods of metallurgy caused the abandonment of the Valencia Mine, although at one time the pay-roll included 1,200 mules and horses.

In olden times hoisting was by eight-horse whims, one at each side of the great octogonal shaft, eleven meters in diameter. Since that time three Fraser & Chalmers 12 by 24 two-cylinder, balanced drum, hoisting engines fitted with 1-in. steel rope. The mine is now idle.

The Cata Mine, like the Valencia and Rayas, is on the central vein system, or true Mother Lode. This is in active operation, hoisting ore to the surface from an octogonal shaft 4 meters in diameter by 240 meters deep. Water is hoisted to a tunnel level in bailing skips 12 feet high by 4 feet in diameter, fitted with bottom valves. Hoisting is by a two-cylinder 12 by 24-in. double balanced hoist. Wood is used for fuel, costing $6.90 (Mexican) per 1,000 kilograms.

The reduction of the Guanajuato ores is generally by the patio system. At one time 50 patios were in operation, each with a capacity of from 15 to 50 tons per day. At that time Chilean mills crushed the rock to 1-4 inch size and arrastras cut it into pulp of 80 mesh. Patio amalgamation with mule teams, sulphate of copper, salt, and mercury collected the values. Washing, retorting and refining yielded the bar of silver.

The total yield of the Guanajuato District is estimated at $700,000,000, which must be interpreted as 92 per cent of the silver contents plus 50 per cent of the gold. The yield from 1880 to 1887 was $35,724,620, as given by the Mint records.

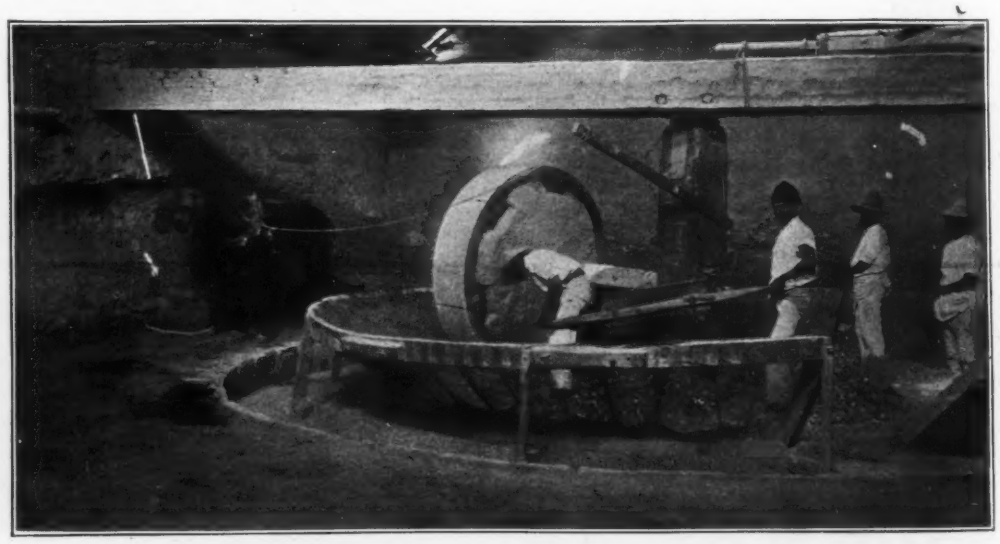
The average values of the ore extracted are given by Dahlgren as follows: 1782, about 102 ounces silver per ton; 1803, about 80 ounces silver; Rayas Mine, 140 ounces silver; 1737, 175 ounces; 1791, 58 ounces; total average, 70 ounces silver to the ton.

The grade mined to-day is about $60 (Mexican) per ton.

THE RECEPTION AT SAN LUIS POTOSI

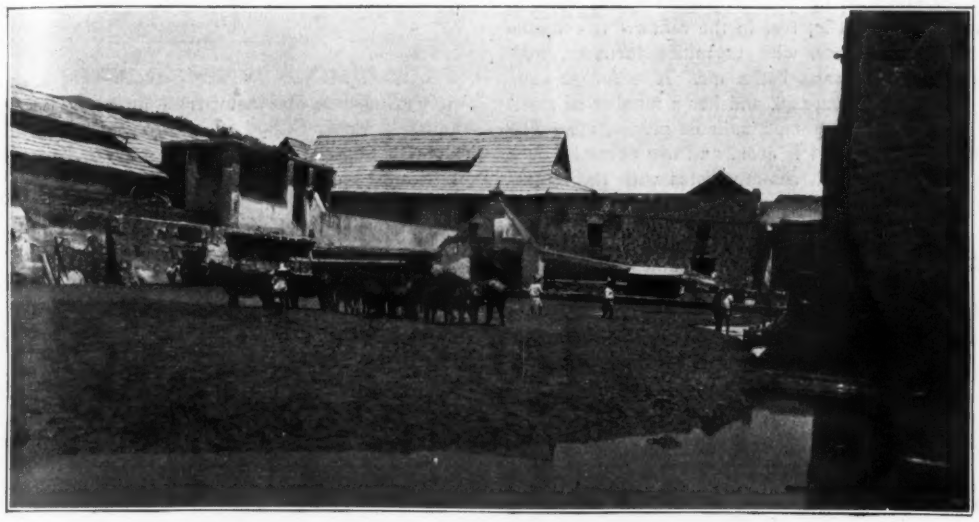
EDITORIAL CORRESPONDENCE.

When the mining engineers reached San Luis Potosi, on Tuesday morning, November 22, they found a full program of entertainment laid out for them. As the train backed into the station they were greeted by strains of martial music from one of the excellent bands which every city of any size in the Republic boasts. Notwithstanding the early hour, the local committee was on hand ready with badges of white ribbon, neatly printed programs and pamphlets descriptive of the city and vicinity. The committee consisted of Mr. A. S. Dwight, chairman, and Messrs. Roberto Spina, D. C. Brown, Luis G. Cuevas, Francisco Coghlan, R. Gmelin, Adolph Martinez, E. H. Messiter, F. H. Taylor and C. M. Van Cleve. At 9 o'clock special cars were boarded and



CHILEAN MILL RUN BY MULE POWER AT GUANAJUATO.

the party was escorted to the Governor's palace and presented to his excellency, Sr. Ingeniero Don Blas Escontria, who welcomed them to the city and State in a brief address. His speech, delivered in Spanish, was interpreted by Mr. Olcott. The Governor thanked the party for including San Luis Potosi in its intinerary. He said they were always glad to welcome strangers, but they were particularly pleased to welcome strangers of scientific attainment, who came here to make a study of the resources of the country, and who would give to the world the benefit of their observations. He expressed the hope that this necessarily hurried and superficial examination would be followed by future and more exhausting studies by members of the party. He trusted that the stay in San Luis Potosi would be an enjoyable one, and that the party would carry away pleasant recollections of their visit. Mr. Olcott replied in his usual happy style, addressing the Governor in Spanish. The entire party was then introduced personally to the Governor by Mr. Olcott. Mr. Olcott stated that the Governor, who was also the honorary president of the local executive committee, was an engineer by profession, and appreciated the importance of the Institute's work, which declaration was greeted with hearty applause.

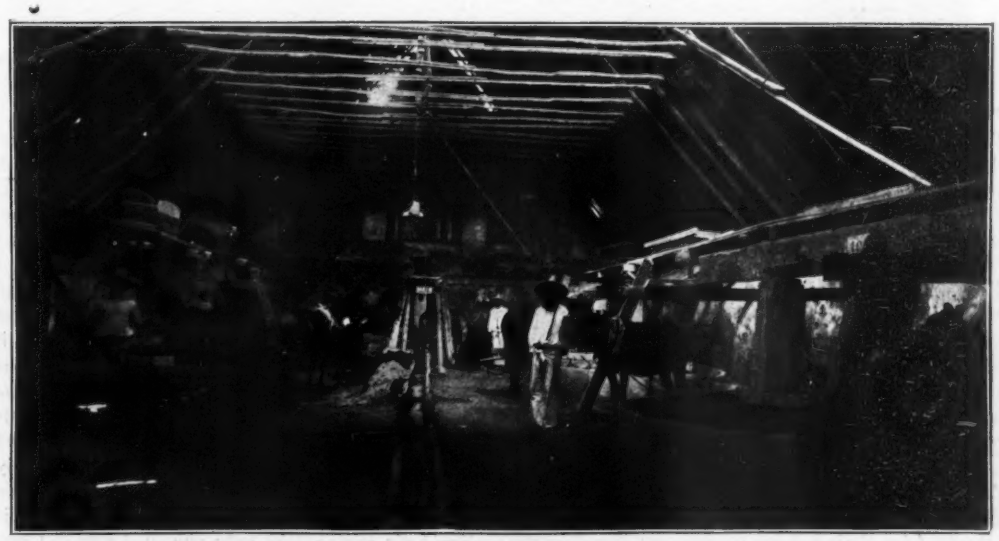


PATIO PROCESS, HACIENDA DE FLORES, GUANAJUATO.

After the Governor's reception, the party returned to the station, where a special train was in readiness to take them to the smelting plant of the Compañia Metalurgica Mexicana, which was reached shortly after 2 o'clock. The smelter is located about five miles out of the city on a gently sloping hill and so arranged that every advantage is taken of the gravity furnished by the hillside. The ore is received in bins the tops of which are level with the floors of the railroad cars. The charging floors, on a level with the bottom of the receiving bins, and the metal and slag are discharged on a third floor below the others. The only elevator in use is for raising the scale of the slag pots to the charging floor for resmelting. The slag is made of use by extending the area of the works and is to be used in the future as a foundation for additions to the plant. The present capacity of the plant is about 1,000 tons of ore per day. The product consists of copper matte and base bullion, both of which are shipped to the Balbach Refining Company, at New York, for refining. A furnace for making blister copper is under construction. About 1,500 men are employed by the company, but these average only about 55 per cent actual working time, so that the men at work each day number about 800. The ordinary laborer's wages here average 37 cents a day, Mexican money, equivalent to about 17 cents in American currency.

An open-air luncheon was served on the lawn of the smelter manager's residence, which is in the smelter grounds and overlooks the works and the picturesque valley in which the city lies. At 2 o'clock a small party was taken in carriages to the Presa de San José, a large storage dam of masonry now in course of construction and nearly completed, which is to provide for the future water supply of the city. The special train left the smelter for the city at 2.30 o'clock, and visits were made to the Cathedral, theatre, Church of Guadalupe, and other interesting places, special cars being provided to take parties of the visitors to such points as they desired. Members of the local committee were on hand to act as guides and everything was done to contribute to the pleasure of the city's guests. The privileges of the club-house of the Sociedad Potosina were extended to the engineers and their ladies, and here was found one place where neither American nor Mexican money was current, if presented by a member of the Engineers' party.

From 8 until 11 o'clock in the evening a serenade was given in the Plaza de la Armas, two bands, one of the 15th Infantry and one of the Military Industrial School divided the program into two parts. The evening closed with an informal ball at the club-house of the Sociedad Potosina. During the evening the street leading from the Plaza to the Club-house was illuminated especially for the occasion. One of the appreciated attentions shown to the party was in the shape of great baskets of bouquets for the ladies, and boutonnieres for the men, sent to the train just before the time set for the ball. The flowers had been sent from Mexico City for the occasion.



ARRASTRAS AT HACIENDA DE FLORES, GUANAJ UATO.

A GOLD DEPOSIT IN THE PHILIPPINES.

By A. M. Howe.

On the island of Mindanao, Surigao Province, about 400 miles southeast of Manila, there is a peculiar gold placer deposit. A mountain ten miles west of the port of Surigao gives pan prospects on all sides from the foot of the hill to the top. The gold in place seems to be in small calcite stringers in serpentine. The extensive disintegration of the serpentine has liberated the gold, which is found in crystalline form. A shale bed-rock has been exposed in some places in workings in the ravines. About 15 Americans, mostly ex-soldiers, were working on the mountain, but none were making wages. The Filipinos, men and women, have worked the deposit for years and according to the local authorities have taken out much gold. The Filipinos work the gulches and hillsides and also drift in under the deposits following good streaks. They use their hands and a stick for digging and carry out the earth in cocoanut shells and baskets to water, where it is panned in a wooden batea, in the use of which they are very expert.

Most of the Philippines are virgin ground, never explored by the prospector.

No white man has ever been in the interior of Mindanao. The Spaniards did not venture far from the coast on account of the Moros.

Many of the streams and ocean beaches give gold prospects. The best the writer saw was about 7 cents to the pan.

Until Congress passes a mining and a land law for the Philippines but little can be done in developing the islands. Land courts should be established to clear up old titles. Mining titles will be easy to clear, as the little mining done by Europeans has all been done under the Philippine mining law of 1846. The titles to agricultural land are in very bad shape on account of many verbal transfers and no records. There is no producing gold quartz mine in the Philippines, but it is certain that there will be later on. The writer saw one vein that assays over $40 in gold.

The climate of the Philippines compares favorably with that of the coast of Mexico and Central America, and is not unhealthy for those who take care of themselves. However, it is too hot for European laborers and it is a good place for the working man to avoid.

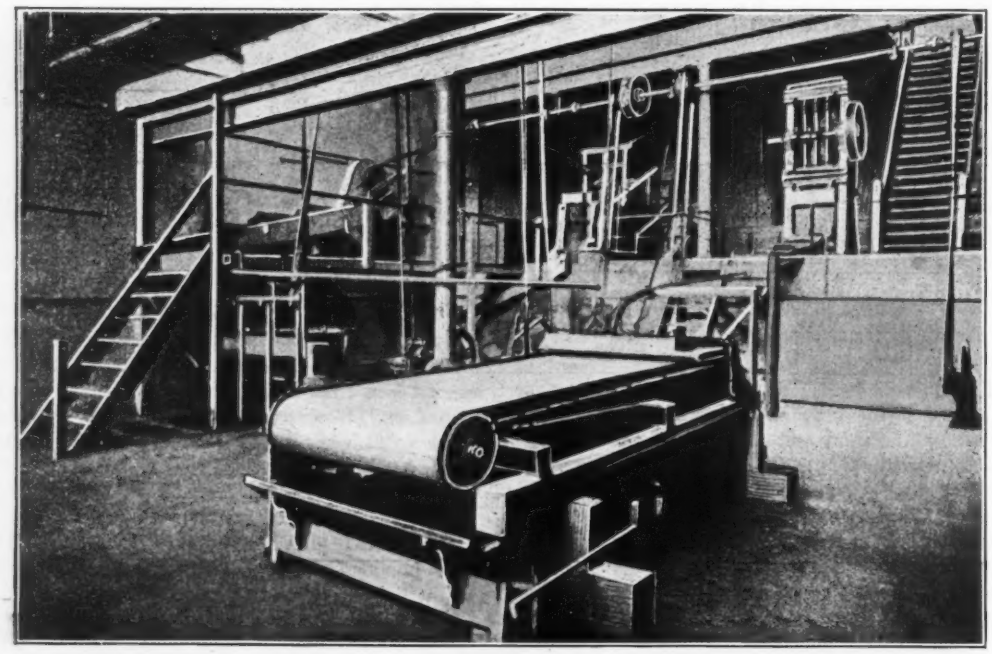
NEW COAL DEVELOPMENT IN ENGLAND. —The London *Colliery Guardian* says that for several months there have been various rumors as to the development of the steam coal in the Sirhowy Valley, Monmouthshire. It is understood that sinking operations will soon take place, two firms having secured extensive areas with a view of raising the minerals. The seams from the east have already been proved by a company, which has pierced across and is now working near Mynyddislwyn Church, about half way between Abercarn and the Valley, and the Cardiff Coal Company is also working the coal to the west of the Rhymney River, and the London & South Wales Company near Nine-mile Point from the south. It is understood that the Abernant Colliery Company will first of all sink two pits at Argoed.

AN AUSTRALIAN MINING SCHOOL.

The Mining School of Sydney University has been in existence since 1892, but up to the present has been somewhat hampered for want of proper buildings and appliances. This deficiency has been partially remedied by the addition of new buildings, reduction plant, chemical, metallurgical and assay departments, etc. Prof. Liversidge has, from the first, taken a leading part in the inception and organization of the school. As early as 1872 he wrote a series of articles to the press advocating the commencement of such an institution. During the years the school has been in existence a large number of students have availed themselves of its teachings, and nearly all have found suitable employment in mines or metallurgical works, a number holding responsible positions in Australia, while several are in the Dutch East Indies.

At the present time between 80 and 90 students are attending the school, and nearly all are going through the complete course for the degree.

Students in the Mining School have the use of the finely equipped laboratories belonging respectively to the chemistry, engineering, physics, and geological departments, and attend the instruction given by the following: Professor Liversidge, chemistry; Mr. J. A. Schofield, and Mr. A. Jarman, demonstrators in chemistry, metallurgy and assaying; Professor Warren and Mr. S. H. Barraclough, engineering; Mr. E. F. Pittman, Government Geologist, New South Wales, mining; Mr. G. H. Knibbs, underground surveying, etc.; Professor Gurney and Mr. E. M. Moors, mathematics; Professor Pollock and Mr. R. S. Simpson, physics; Professor David and Mr. W. G. Woolnough, geology and mineralogy; Mr. Basil W. Turner, metallurgy.



TESTING PLANT, UNIVERSITY OF SYDNEY, N. S. W.

The crushing and concentrating room contains a three-stamp Krupp battery, a present from Messrs. Noyes, Sydney; a Gates stone-breaker, an ore-feeder presented by Park & Lacy of Sydney; sampling machines, drying floors, Carter disintegrator, amalgamated copper plates, elevators, jigs, small Chilean mill for grinding chemicals, Frue vanner with all appliances complete, cyanide vats, chlorination and hyposulphite and other leaching vats, slime pits, Hungarian mills, etc. This room is, however, by no means complete. To give the student an opportunity to learn the use of all the modern devices that are used in the concentration and saving of ores, there ought to be appliances for the more complete and thorough handling of the slimes, such as Wilfley tables, buddles, spitzkasten, filter presses, agitators, etc. The student should also be taught to experiment in the processes of dry crushing, and in the use of ball mills. In this room, which is about 35 by 60 feet in dimensions, with a good elevation, the students work in parties; that is, each party is given a lot of ore to reduce, and they make the most out of it they can. The capacity of the plant is about 6 tons per day, according to the quality of the ore, and the conditions under which it is handled. Close to this room is the experimental roasting furnace, an ordinary open hearth, with a capacity of a few tons per day. The fuel bins are ranged alongside. They are fitted with self-acting doors, whereby greater facility in discharging the load is afforded.

The assay laboratory is a very important department, and comprises a lofty, well ventilated apartment of about 60 by 50 feet ground space, with an elevation of about 45 feet in the center. It contains 20 melting furnaces, with 12 muffle furnaces, with draft cupboards, sand baths, etc. It is for 32 men, but will accommodate 48, and has a number of small gas furnaces, filter pumps, exhaust pumps, etc. The furnaces are encased in iron, and are operated by a downcast flue, which communicates with the central smoke stack, whereby the room is kept cool and comfortable to work in during the hot summer weather.

The chemical laboratory has been erected now some 12 years. It has a ground space of about 170 by 86 feet, and in consequence of a large increase in the number of students since its erection is now far too small. It has accommodation for about 100 students, contains two lecture rooms, two principal laboratories, and a number of special rooms. There is a large lecture room which will seat 180, and a smaller one which will seat 120 students. The junior laboratory contains 40 benches, and the senior laboratory 48. There are a number of separate rooms for various purposes, such as spectroscopic and gas analysis and photography. There is a laboratory of research, and a museum of chemical collections. There is a liquid air engine (the only one in Australia) and a gas engine. There are three balance rooms, with all the necessary appliances.

The building is lighted by electricity throughout, and leads are carried to convenient places in the laboratories, so that if necessary the full power of the dynamos may be used for experimental purposes. In addition to the new assay laboratory, there are 12 fusion and four muffle furnaces in the main building. The working benches are fitted with drawers, and draft cupboards with hot plates. They are also provided with gas, water and exhaust pumps, in much the same way as in the chemical laboratory.

A feature in the assay laboratory, as well as in the chemical laboratory, is that all the water baths and water ovens are kept full by means of constant supply cisterns with ball taps, so that there is no danger of their running dry. There is no limit to the number of baths and taps which can be supplied by one cistern and ball tap. Thus it will be seen that the school is in every way complete in design and arrangement, but requires the introduction of some few mining devices to render it complete in the details of practical mining. During part of the vacation, the lecturer in metallurgy arranges to take students for excursions to works in the State.

The accompanying illustration—for which we are indebted to the *Town and Country Journal* of Sydney, N. S. W.—shows the milling room, with stamp mill, vanner and other machinery.

FILLING MINES WITH SAND.—The London *Colliery Guardian* says that various methods have been adopted in Upper Silesia for packing the spaces made by taking out the coal; but all of them have their disadvantages, whether they be inefficient owing to the gob material subsiding too much or the expense being too great—such, for instance, as the method of gobbing with sand, which has been adopted for some time past at the Brandenburg Mine, near Ruda. The new method, however, which has for the last few months been applied to the Myslowitz Mine, owned by the Kattowitzer Aktien-Gesellschaft, is stated to be free from these disadvantages. The sand, large quantities of which are found on the surface of the colliery, is mixed with water by mechanical means, in such a manner that one cubic meter of water carries along with it half that quantity of sand, which is led into the worked-out places, while powerful pumping engines distribute the mud thus formed, so as to ensure an efficient taking off of the water, the sand forming a foundation for the portion of seam resting upon it.

LOOKING FOR PLATINUM IN CANADA.—The latest *Bulletin* of the Ontario Government Assay Office says: "The commercial use of metallic platinum is being so widely extended at present and the consumption increasing at such a rate that ingot platinum is now quoted at $21 per ounce, platinum in the ore being worth about $17 per ounce according to assay value. The value of platinum is not likely soon to decrease, hence any ore carrying platinum capable of being extracted commercially is in constant demand. The rise in value of platinum is caused by increased consumption in photographical work, electric lighting, incandescent lighting mantles heated by burning gas, instrument-making and various apparatus made entirely or in part of platinum and other uses in the arts.

"Platinum is principally found in the native form, occurring generally in alluvial sands associated with garnets, magnetite, topaz, corundum, zircons, native gold and other heavy minerals Platinum metals are found as small grains or scales of a tin white color when cleaned with nitric acid. The scales are generally too fine to catch the eye, and collect with a heavy fine sand as streaks of brown or lead colored particles which are very heavy and can be concentrated by washing with running water or by panning. The ordinary riffles in a gold-saving sluiceway will not save all of the platinum metals to be found in alluvial sand as some of the values creep over and are lost. Nor will the platinum metals amalgamate with mercury without special treatment. There are several satisfactory methods of concentrating alluvial sands so as to save the platinum metals.

"Platinum occurs in the Sudbury mining district as sperrylite, which is a combination of platinum and arsenic found in the gossan of the Vermillion nickel mine. The matte formed by smelting the nickel-copper bearing pyrrhotites of the Sudbury District contains platinum which is saved in the process of refining the metallic contents. It is possible that closer search of placer sands will result in finding more of this valuable metal in paying quantities for working by hydraulic methods."

THE SIERRA MOJADA, COAHUILA, MEXICO, AND ITS ORE DEPOSITS.*

By James W. Malcolmson.

This paper treats of the history and development of the Sierra Mojada mines in the north of Mexico, the character and extent of the ore deposits, and the methods of mining the ore. The growth of the smelting industry in Mexico in recent years is, to a large degree, due directly to the output of the lead-bearing ores from the Sierra Mojada mines, and at the present time (1901) new smelters are being built, looking to this district for their supply of lead-ores. These mines are located in the southern part of the State of Coahuila, in the Republic of Mexico, in latitude 27° 24′ N. and longitude 103° 43′ W. of Greenwich.

The distances by rail from Sierra Mojada to the principal smelting centers are as follows: To Torreon, Coahuila, Mex., 179 miles: to Monterey, Nuevo Leon, Mex., 422 miles; to El Paso, Tex., U. S., 494 miles; to Aguas Calientes, A. C., Mex., 522 miles; to San Luis Potosi, S. L. P., Mex., 644 miles; to Pueblo, Colo., 1,158 miles; to Argentine, Kan., 1,661 miles. The larger proportion of the ore mined hitherto has been shipped to El Paso, Tex., and to Monterey, Mex.

I. *History.*—In June, 1878, a certain Nestor Arriola or Arriolana obtained permission from the government to form a band of men to go to this part of the desert and watch for a party whom he suspected to be coming from San Antonio, Tex., with a load of contraband goods. He thought the smugglers would pass near the mountains where the mines are to-day; but they took another road, thus causing him to spend several idle days. During this time he found some lead-bearing ore, of which he had assays made at his home in Mapimi; and, finding that it contained silver, he returned with some prospectors, located the Blanca Mine, and also sunk a winze on what is now the Jesus Maria Mine. The camp soon obtained an immense amount of notoriety. One expedition went from Pachuca in 1879, under the direction of the Real del Monte Mining Company, which sent a fully-equipped party to the camp—a distance of more than 600 miles overland—by stage and wagon.

The mines are in the midst of an extensive desert, and at the time of their discovery the nearest railroad point was San Antonio, Tex. In the early period of its development, the camp was claimed by the adjoining States of Chihuahua, Coahuila and Durango. Until the rival claims were settled, the district was governed as a territory by the national authorities. It was finally declared to be a part of the State of Coahuila; and, at the present time, 30 per cent of the entire revenue of that State is derived from taxation of the Sierra Mojada mines and their products.

The first ore-bodies discovered were basic lead carbonates in limestone, out-cropping at the surface, and lying nearly horizontal, with a slight dip to the south. For several years these were the only deposits known to exist; but eight years ago very large ore-bodies of siliceous copper-ore, high in silver, were discovered. Latterly the limestone itself in the vicinity of the copper and lead ore deposits has been worked with success, by reason of the silver chloride disseminated through it.

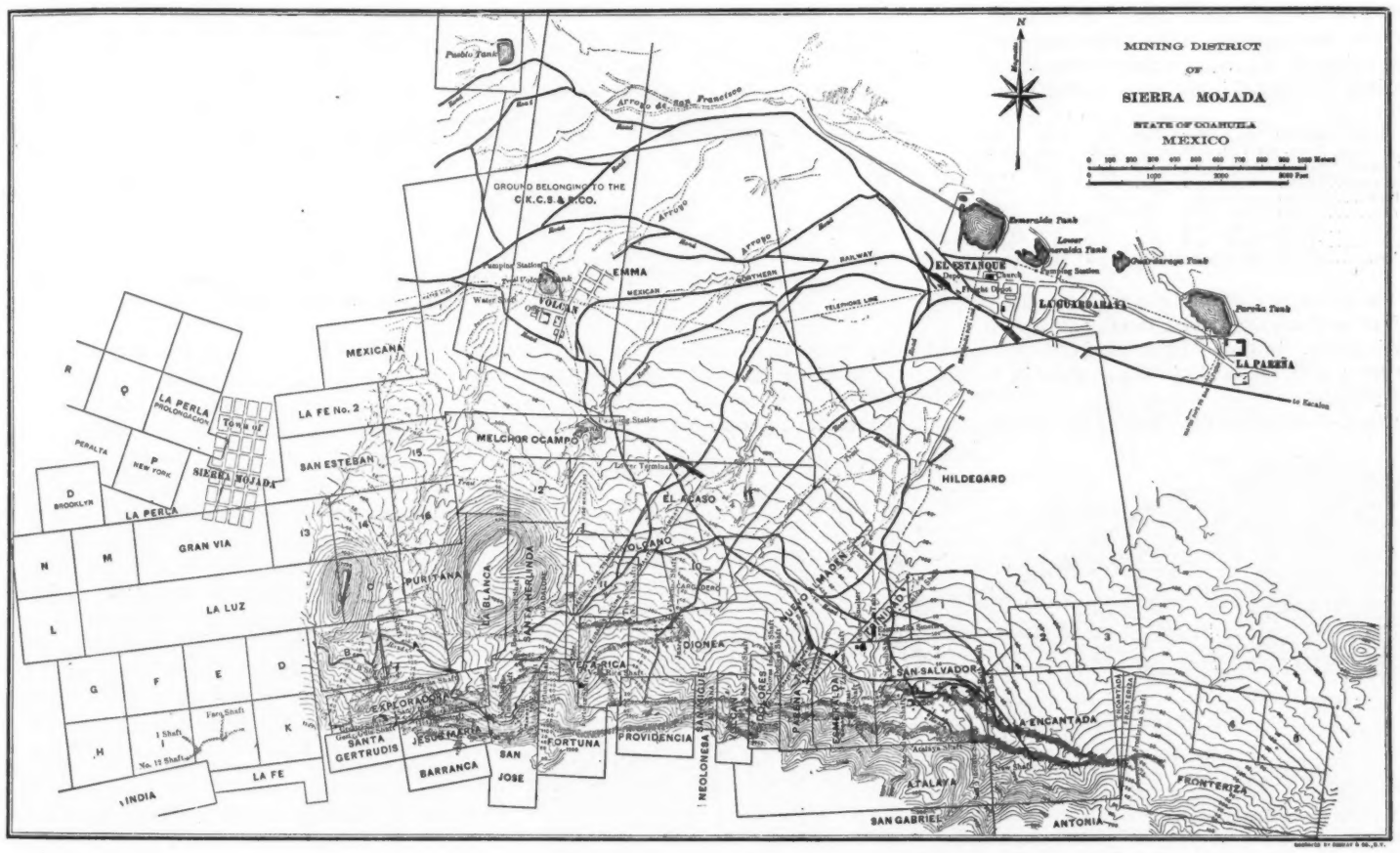
The mines were originally worked by their Mexican owners in a somewhat primitive style; but in 1887 a great impetus was given to their development through the acquisition of the control of the two principal mines, the San Salvador and the San Jose, by the Consolidated Kansas City Smelting and Refining Company. Since then, American methods and American capital have been employed with great success in opening up the mining properties; and to-day nearly the entire output is produced under American control and supervision.

In the early days the ore was freighted by teams 75 miles to Escalon, and shipped over the Mexican Central Railroad to El Paso, Tex., or to Argentine, Kan. No duties were collected by either the Mexican or the United States Government. In 1889 a local duty of 2.6 per cent. of the value of silver and lead contents was imposed; and, since 1896, an additional duty of 4.5 per cent on the silver contents has been collected at the frontier by the Mexican Federal Government; and by a decision of the United States customs authorities, ratified by subsequent legislation, a duty of 1.5 cents per pound on the lead has been collected on its admission into the States.

To-day, on the average grade of ore (assaying 10 ounces of silver per ton and 15 per cent of lead, produced in the Sierra Mojada, and shipped to the United States, 7 per cent of the value of the silver contents is collected by the Mexican, and 37 per cent of the value of the lead contents by the United States Government, or, in all, between 50 and 60 per cent of the amount paid by the smelter to the miner for the ore on the mine dump. Much of the lead ore shipped at the present time to the United States is smelted in bond, and subsequently sold outside of the country.

The decision of the United States customs authorities—known as the Windom decision—was the result of strong representations of the Colorado smelters, who believed that Mexican lead, was ruining their business, through the competition of the Missouri River smelters, to which points the Sierra Mojada ore was shipped. The apparent results after the imposition of the duties were, that the Colorado miners were charged $1 more per ton for the treatment of siliceous ores, on account of the diminution of the lead supply; a powerful and successful smelting industry, employing thousands of men, has been developed in Mexico by the investment of millions of dollars, largely of American capital; and another result has been that Missouri lead ores, low in silver, have been diverted from their natural path East over a long westerly detour, first to Colorado, and finally back to the East again, as bullion.

II. *Production.*—The early production of the Sierra Mojada was small; but in April, 1886, the weekly ore product from the entire district was about 1,000 tons, which would be, roughly, one-quarter of the present output. Since the building of the Mexican Northern Railroad in 1890, the average production has been approximately 200,000 tons annually.



1.—MAP OF SIERRA MOJADA MINING DISTRICT.

*Paper read before the American Institute of Mining Engineers, Mexican meeting.

The production during 1900, from official returns, was 187,110 metric tons, as follows:

Mine.	Metric Tons.	Mine.	Metric Tons.
Veta Rica	41,018	Jesus Maria	3,980
San Jose	30,285	La Sultana	3,039
San Salvador	28,783	Parena	2,475
Volcan Dolores	15,552	Buena Ventura	2,040
Tiro Juarez	14,331	Exploradora	1,017
Encantada	13,470	Tiro B	646
Tiro II	10,595	San Francisco	530
Esmeralda	7,931	Galan Zona	190
Providencia	6,032	La Aurora	5
Fortuna	5,191		

On account of the inaccessibility of the camp, no ore was considered worth mining, in the early period of operations, which did not assay 20 ounces silver per ton and 25 per cent of lead, with a large excess of iron over silica. Slags then made would contain as much as 30 per cent of lead. In 1892-96 a large tonnage of copper ore was mined, assaying from 30 to 120 ounces of silver per ton, the whole production averaging between 60 and 70 ounces of silver per ton, with 4 to 5 per cent of copper.

At the present time, practically the same ore bodies are being worked which were discovered in the early period of development; but the improved conditions permit the profitable mining of a very much lower grade of ore than formerly. The following table shows approximately the tonnage, assay and analysis of the various ores mined in the camp during 1900:

	Metric Tons.	Ag. oz. per Ton.	Pb. Per cent.	SiO_2. Per cent.	FeO. Per cent.	CaO. Per cent.	$BaSO_4$ Per cent.
Basic lead ore	80,000	9.0	15.0	16.0	36.0	5.0	...
Siliceous lead ore	23,000	10.0	14.0	34.0	22.0	2.0	...
Irony lead ore	7,500	3.0	15.0	3.0	58.0	2.0	...
Siliceous ore	2,500	19.0	0.0	73.0	10.0	1.0	...
Irony ore	1,000	1.0	1.0	3.0	77.0	1.0	...
Lime ore	25,000	8.0	0.0	7.0	3.0	33.0	...
Siliceous lime	52,000	18.0	0.0	20.0	3.0	21.0	10.0

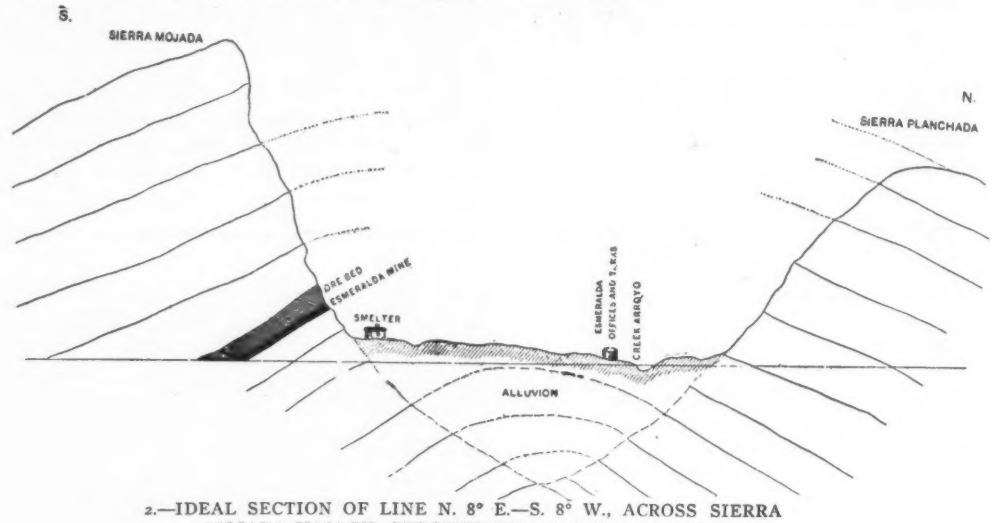
In all the mines now open there are very large bodies of mineral of the classes mentioned above, but lower in grade. In time, with lower freight and treatment-rates, these will undoubtedly prove to be a source of profit.

III. *Geology.*—The mountains forming the Sierra Mojada are entirely of limestone, of the Carboniferous series, which in this part of Mexico attains an enormous thickness. Their most prominent feature is an almost vertical cliff overlooking a small plain, three-quarters of a mile in breadth and 6 or 7 miles long, to the north. This cliff rises to a height of over 3,000 feet above the level of the plain, making an impressive and majestic view.

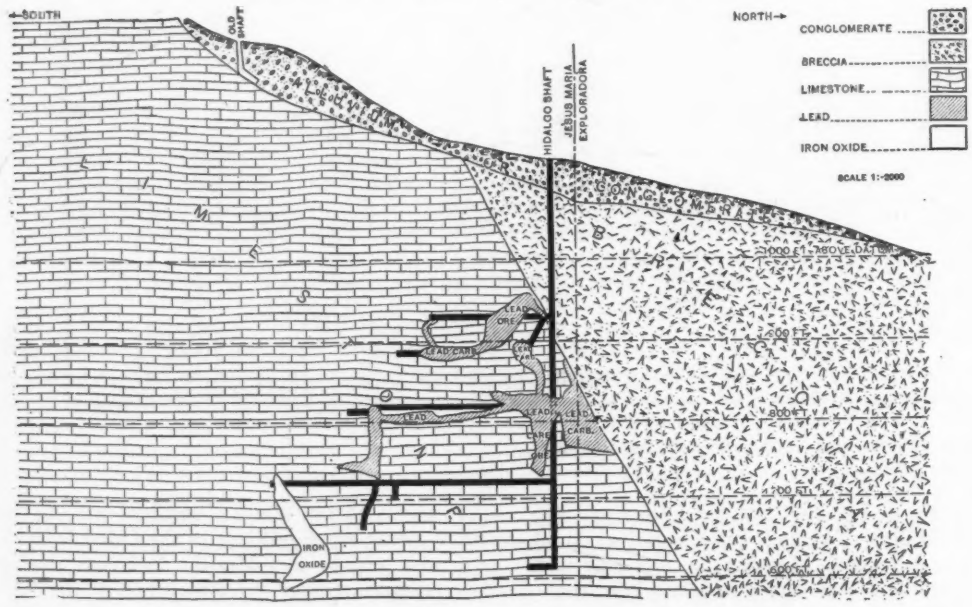
In Mr. Chism's ideal section of the camp, the general character of the folding movement of this great limestone formation is well represented, but it can hardly be considered as a simple bending, because in places on the Sierra Mojada precipice the limestone strata can be seen where they have been folded upwards to a vertical position at right angles to the normal dip. In addition, therefore, to the flexure observed and mapped by Mr. Chism, it is evident that faulting and dislocation of the strata has also taken place to some extent.

The alluvium described by Mr. Chism in his paper has also, on further investigation, proved to be an interesting feature of the district. Instead of being a recent product of erosion, as Mr. Chism believed, it is covered, in places, with patches of Cretaceous lime, towards the east of the camp on the Trinidad and Parrena claims and towards the west on the Blanca claim. The Cretaceous lime, which exists in a capping forming the summit of the Blanca Hill, is 100 feet thick.

This Cretaceous limestone, overlying the alluvium, is a proof that, after flexure and erosion of the great underlying limestone formation, there was a second submergence of the district below water-level. Apparently the Cretaceous lime is not in any way related to the ore deposits; but it is of interest as showing the geological character of the changes which have taken place during the process of ore-deposition.



2.—IDEAL SECTION OF LINE N. 8° E.—S. 8° W., ACROSS SIERRA MOJADA VALLEY, THROUGH THE ESMERALDA MINE.



3.—JESUS MARIA AND EXPLORADORA MINES. N.—S. SECTION THROUGH THE HIDALGO SHAFT.

Below the alluvium described by Mr. Chism, and between it and the underlying limestone, there has been found another formation, namely, a porphyritic breccia, entirely different, both in appearance and in composition, from the conglomerate or alluvium above. The alluvium is composed of rounded boulders and pebbles of limestone cemented by calcareous material, and is a product of erosion of the surrounding mountains. The breccia below is made up of angular fragments of felsitic and granite rocks, cemented by a siliceous matrix.

The conglomerate is porous; but the breccia is impermeable. Advantage is taken of this fact to sink shafts through the conglomerate to the breccia, in order to obtain a water supply, which is fairly abundant. The surface of the breccia, below the alluvium, is apparently in the shape of a trough or gulch, running from west to east; a shaft sunk on the Emma claim, showed the alluvium at this point to be 510 feet thick; and the alluvium breccia contact dipped to the south, indicating the probability that the center or deepest point of the gulch in that locality was farther south. Probably 30,000 or 40,000 gallons of water daily can be obtained from a well such as this; but it is not improbable that after a very long period of drought only those wells which are located in the lower horizons of this underground trough would retain water.

Sinking into the breccia fails to develop more water; and the limestone below it is quite dry. The normal water level has not yet been reached in the camp, and water is never overabundant. Towards the southern boundary of the alluvium the feathering-off of both it and the breccia is shown. The breccia outcrops at the surface in few places only, but is very close to it in the Jesus Maria and Exploradora claims, and only 70 feet deep in the Dionea claim. The origin and deposition of the breccia have been the subject of much speculation. It is soft and easily worked, and has been considered to be a disintegrated product of faulting. It is more probably a volcanic mud flow from below the center of the valley, between the Sierra Mojada and Sierra Planchada ranges.

Porphyritic breccias, or volcanic mud flows, of this character, are common in the north of Mexico. In the lead-mining district of Santa Eulalia near the city of Chihuahua, northwest of Sierra Mojada, an immense area of limestone is covered with somewhat similar breccia, which in this latter case forms the summits of the mountains instead of the bottoms of the valleys. In places at Santa Eulalia it is more than 1,800 feet thick. As a rule, the Santa Eulalia breccia contains rounded fragments of limestone, but in some horizons it carries angular fragments of porphyry, at times very similar to the Sierra Mojada breccia. In the rounded limestone pebbles enclosed in the porphyry at Santa Eulalia it is not uncommon to find unaltered fossils, indicating the absence of any great amount of heat during the processes forming the breccia. The matrix of the breccia in Santa Eulalia is highly siliceous, containing glassy feldspar, and resembles a typical porphyry. To the writer it is difficult to account for the presence of feldspar crystals and unaltered limestone fragments in the same rock. But it seems more difficult to consider the Santa Eulalia or Sierra Mojada breccias as other than volcanic mud flows, which probably have been squeezed upward through dikes, zones of fracture, or other apertures in the limestone. Several of such dikes (in all cases without lime or other fragments) have been opened up in Santa Eulalia, breaking through the underlying limestone formation; but in the Sierra Mojada nothing is yet known as to the source of the breccia.

The siliceous breccia of the Sierra Mojada, which lies directly upon the limestone, is intimately connected with the ore bodies. The contact between the breccia and the limestone is smooth, and carries ore deposits of value. The most valuable ore body ever opened up in the camp—the San Jose copper stope—was apparently an impregnation of the siliceous breccia with silver chloride and copper oxide. In this, as in all other cases, there was a well-marked wall or plane of demarcation on each side of the ore body, with a clay selvage or gouge between the ore and the adjoining rocks. In a few places along this ore body a thin layer of barren breccia would be found between it and the lime; but usually the north wall of the deposit was breccia, and the south wall limestone. In the Dionea Mine, from 15 to 16 feet of the contact between the breccia and the underlying limestone is very much decomposed, although carrying nothing of value. The steepness of the breccia lime contact in the San Jose Mine is very noticeable, and in the Buena Ventura shaft the lime is cut at a depth of over 600 feet; but north of this it gradually assumes a more horizontal position. In the Veta Rica and Dionea mines the contact gradually flattens until at the Juarez shaft it is 130 feet from the surface. In places, the roll or fold is so great that the local dip of the contact is towards the south. In the Veta Rica and Dionea mines this roll or crease of the breccia-lime contact was found to carry ore, while the limestone for a distance of over 100 feet from the contact was impregnated with silver chloride. Other rolls or folds of the contact surface, the axes of which run approximately north and south, that is to say, at right angles to the last mentioned folds, have been found by diamond drilling, but hitherto have not been demonstrated to carry ore or give indications of value.

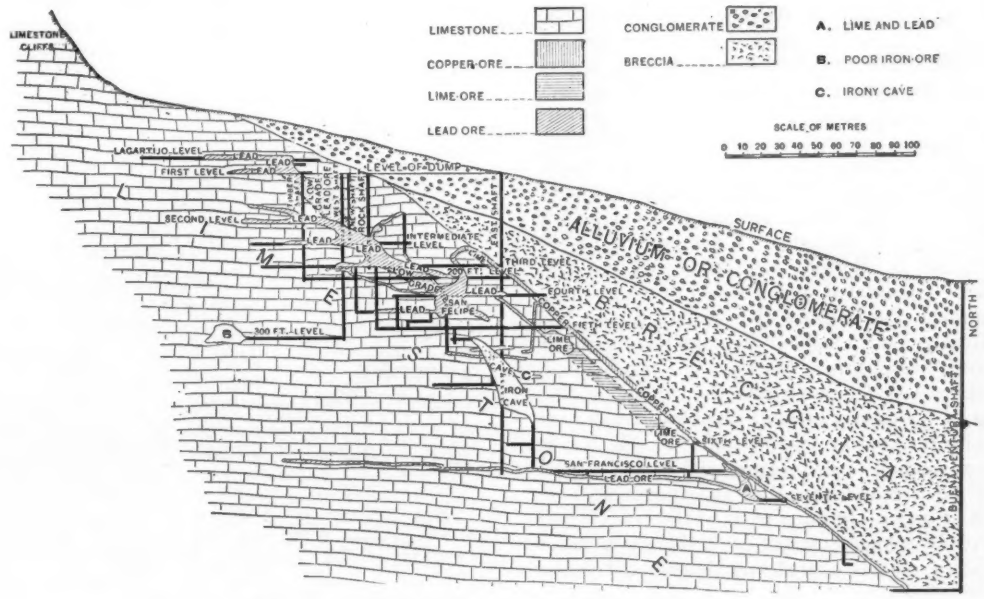
IV. *The Ore Bodies.*—The zone in which the ore-bodies have been found is approximately along an east and west line. The ore bodies are fairly continuous, and extend for a total distance of over 13,000 feet from west to east. The ore deposits of the camp may be divided into three main groups: (1) The contact deposits; (2) The lime-impregnations; and (3) The lead-carbonate ores in the limestone. Although the latter were the earliest ores discovered and worked, the breccia-lime contact deposits will here be described first; since the earlier-worked ore bodies are apparently branches from these deposits, and were the first discovered only because the breccia and conglomerate had been eroded from their vicinity, leaving the lead-ore exposed.

In the Exploradora Mine a body of lead-carbonate of considerable thickness was found on the contact towards the extreme west of the zone of ore deposition. The breccia here was apparently unchanged, but a large amount of the limestone had evidently been removed in the process of ore deposition. After the ore had been mined out, the breccia settled on the square sets and rock filling to such an extent that a marked subsidence and slip of the overlying breccia took place, the whole mass sliding apparently on the contact surface. From this deposit of lead-carbonate, a very plain vertical crack runs directly to the south into the lime, making a prominent feature of the western part of the Jesus Maria Mine.

The crack shows slickensides, although the breccia contact to the north does not appear to be deformed or faulted in any way. This crack is intimately connected with a deposition of several thousand tons of basic lead-carbonate in the limestone, some distance from the contact; and still farther south a large body of iron oxide has been opened up, with very low silver and lead values. Several of these vertical fissures at right angles to the contact have been prospected. Their origin and importance is still a matter of conjecture. The fissure described towards the west of the Jesus Maria Mine is one of the most strongly marked, and it shows ore bodies related to it in a more noticeable manner than any other. East of the Exploradora lead-carbonate deposit, and between the Jesus Maria and San Jose mines, an ore body has been opened on the contact assaying from 15 to 25 ounces silver per ton; 75 per cent silica; 8 per cent iron; less than 1 per cent lime, and carrying traces of lead and copper. This ore body varies in thickness from 10 to 20 feet; it is friable and sandy in structure, easily mined, and covers a large area, being found from the outcrop of the contact surface in the Jesus Maria Mine to a considerable depth in the San Jose Mine. The lead-carbonates in the limestone immediately south of this deposit, instead of carrying an excess of iron over silica, as they did to the south of the first ore deposit mentioned, are siliceous, carrying an excess of silica over iron.

Only a short distance east of the siliceous contact ore, but at a greater depth, was found the famous San Jose copper stope. It is probable that the last mentioned siliceous contact deposit and the copper stope form a continuous deposit, changing in character with depth.

The San Jose copper stope was the first ore body discovered on the contact, and is the richest exploited hitherto in the Sierra Mojada. Its dimensions are, roughly, 450 feet from East to West, and shown, where the copper stope changes to lead-carbonate and dips south. The deposition of the lead-carbonates appears to be connected in some way with a plane of fracture or shrinkage parallel to, and some 120 feet south from, the breccia contact plane. This plane or zone is observable on the general section of San Jose, and a number of flat lead-carbonate ore bodies may be seen running between the planes of stratification towards the south, branching from the inclined plane of lead deposition, which is parallel to the contact. These two parallel planes, that of the copper ore on the contact, and that of the lead ore 120 feet south, and wholly in the limestone, have given rise to a belief that the copper and lead carbonates represent distinct periods of ore deposition. Between the zone of deposition of the lead ore, parallel to but some distance from the contact, and the copper ore on the contact itself, much of the limestone is impregnated with silver chloride, and from 0.5 to 2 per cent of copper. To the east of the copper deposit in the San Jose and Fortuna mines, very little ore has been found on the higher levels of the contact; but northeast of the Veta Rica and Dionea mines the limestone was discovered much



4.—SAN JOSE MINE, GENERAL ELEVATION, LOOKING WEST.

530 from North to South on the dip of the contact. In thickness it varied from 6 to 20 feet, with a general average of perhaps more than 12 feet. The ore mined from the deposit assayed between 60 and 70 ounces of silver per ton; 4 to 6 per cent copper; 40 to 50 per cent silica; 3 to 8 per cent iron; and 1 to 5 per cent lime, with traces only of lead.

The discovery of this deposit in 1889 was the cause of a new period of development in the camp. Shafts were sunk at many points to the lime contact, with the object of investigating a region which had previously been considered valueless; but the result up to the present time has not been so productive as was originally anticipated. Only a few ore bodies have been discovered, and immense areas of the contact have been demonstrated to be barren. No purely contact ore body of any size has been discovered that at all approaches the San Jose copper stope in either tonnage or grade of output.

The San Jose copper deposit differs principally from the two previously mentioned deposits in that it is apparently an impregnation of a layer of breccia between the main body and the limestone. There seems to have been no solvent action on the underlying lime, as in the Exploradora deposit, or leaching out of the alumina silicates, as in the second deposit described. The chemical composition and appearance of the San Jose copper deposit and overlying breccia are almost identical. The basic lead-carbonate ore bodies south of this contact ore are entirely isolated from it, except at the upper part, as nearer to the surface than was originally expected, and extensive prospecting developed the existence of the above-mentioned huge roll or crease of the contact surface. Mineral of low grade, somewhat similar in character and composition to the San Jose contact ore, was found; but the financial result of the exploration was bad for a number of years. Finally in the Veta Rica Mine the discovery was made that, although the contact mineral itself was poor and unprofitable near the vicinity of the roll, the limestone below was impregnated with silver chloride—although at the same time with silica—to such an extent that the siliceous lime could be mined with a very respectable margin of profit. The ore carried, as a rule, 15 to 50 ounces Ag; 20 per cent SiO_2; 20 per cent CaO; 10 per cent $BaSO_4$. In some parts of this ore body the silver-bearing lime is separated very distinctly from the surrounding barren lime; but in most directions, particularly to the east and west, there are no definite boundaries to the ore body.

As mining progresses, the grade gradually becomes so low that it no longer pays to continue operations. Many thousand tons of ore have been mined from this ground, assaying from 15 to 40 ounces Ag; 10 to 20 per cent SiO_2; 20 per cent CaO; 3 per cent Fe; and 1.5 per cent Cu, with no lead.

The finding of lime-silver ores below the contact of the breccia aroused renewed interest in prospecting, not merely along the contact itself, but down into the limestone; and latterly, northeast from the

Veta Rica Mine, in the Tiro 11, Dionea, and Tiro 10 ground, a limestone deposit of considerable size has been opened up, several hundred feet in length. Here two rolls in the breccia contact were found, one a few hundred feet north of the other. The axes of these rolls are roughly east and west; and they seem to be a northeasterly continuation of the roll previously found in the Veta Rica Mine.

In the northern roll, in the Dionea Mine, the Juarez shaft was sunk through 72 feet of calcareous conglomerate, 59 feet of siliceous breccia, and 16 feet of decomposed contact matter without value, to solid barren lime. Sinking being still continued, the rib of barren lime proved to be only 13 feet thick; and impregnated lime was discovered below it, assaying from 30 to 60 ounces silver per ton, with 15 to 20 per cent silica. The Veta Rica deposit is of a somewhat similar composition. In the Dionea Mine the southern roll contained, in the lime below the contact, siliceous lead carbonates, assaying from 12 to 15 ounces silver per ton, and 15 per cent lead, with an excess of silica over lime.

The silver-lime impregnations are now of greater importance than the contact deposits. They are divided into two classes: (1) those near the breccia contact; and (2) those far from the contact, in the vicinity of the lead-ore deposits. The first class (near or adjoining the contact) are found west of the contact, in the San Jose, Veta Rica, Tiro 11 and Dionea mines. These ores usually carry 20 per cent CaO; from 15 to 20 per cent SiO_2, partly existing as silicate of alumina; and barium sulphate from traces up to 12 per cent. Iron and zinc are found in small quantities (not above 3 per cent); and most of the ore carries copper, seldom exceeding 2 per cent, but perhaps averaging 0.5 per cent. The silver is found as chloride. Apparently this limestone has been impregnated and silicified from the contact, through the leaching of a contact deposit and its dissemination throughout the adjoining limestone. It is an interesting fact, however, this may be, that the impregnated limestone near the siliceous copper deposit on the contact presents some features in common with the contact deposit itself. In this respect the large amount of decomposed and barren contact matter found in the Veta Rica and Dionea mines is worthy of notice. In other parts of the camp, where no silver-lime impregnations exist, there is a marked absence of this altered and decomposed barren contact material.

The San Jose deposit, which is of immense dimensions, is separated from the overlying copper stope by 40 feet of barren limestone. The copper stope contained from 4 to 5 per cent of copper and 60 to 80 ounces of silver per ton, and apparently had not been impoverished to any notable extent. The condition of the silver-lime ore body here is an interesting commentary on this observation. It assays from 4 to 12 ounces of Ag, and from 40 to 50 per cent CaO, with traces of copper and only 3 per cent SiO_2. It is practically a pure carbonate of lime, slightly impregnated with silver and little or no silica. The siliceous lime is dark-colored and easily distinguished from the barren lime. The San Jose limestone last mentioned is quite indistinguishable from the barren lime formation. Indeed it is only by constant vigilance and care that it is possible to mine the ore at all. It is necessary to take daily, from all working faces samples of large size for assay; and even with this precaution it is not uncommon for lots of considerable size to be mined at a loss, on account of an unexpectedly sudden change in the assay value. The boundaries of the silver-lime deposits are at times very plainly marked by walls separating the barren lime from the impregnated lime; but usually such boundaries are not reached in mining, because the grade falls to an unprofitable limit, which varies with the silica contents of the lime. It is common to find ribs and irregular masses of quite barren lime running through good stopes, with well-marked walls and good ore on both sides. There seems to be no general direction to these barren zones; sometimes they are parallel, and sometimes at right angles, to the stratification. The lime ore-body previously described, south of the copper contact ore in San Jose, is entirely separated from it by a rib of barren lime; and it is not likely that these silver contents were derived from the contact, at least not likely that they came from is upper levels. This lime was originally discovered by following a fissure containing lead carbonate downward from the fourth level, 120 feet from the contact. The lead ore contained a large percentage of barium sulphate and silica, and changed in depth to very low-grade iron oxide, which finally disappeared, leaving only fissure walls. In this fissure, parallel in strike and dip to the contact, sinking was continued in barren lime until near the 5th level. Here the lime was charged with silver chloride; and there can be but little doubt that this impregnation came from the fissure, or others parallel to it, which perhaps at a deeper level run toward the breccia contact. A crosscut was driven from the copper stope at the 6th level, 200 feet below the 5th, with the result that the silver lime was again found, with 45 to 50 per cent of lime, so that the presence of a large area of silver-bearing limestone was thereby demonstrated.

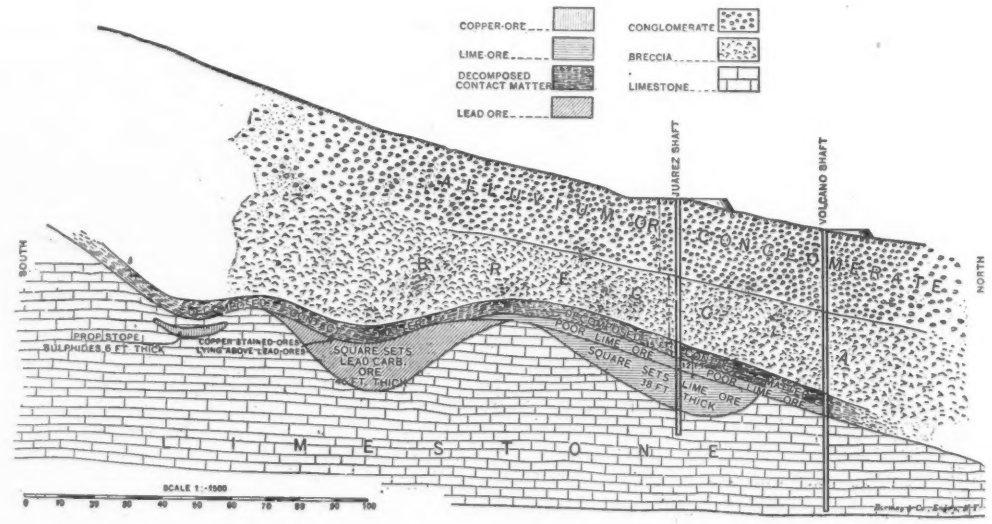
Silver Impregnations of the second class in the limestone (those found near, and associated with, the lead ore bodies), are found towards the eastern part of the camp, and have been principally worked in the San Salvador Mine. There are here two classes of ore, found respectively in the upper and in the lower levels of the lead deposits. The upper lime ores usually contain 20 per cent of lime, and in addition carry 10 to 30 ounces Ag; 3 per cent Pb; 3 to 8 per cent SiO_2; 8 to 10 per cent $BaSO_4$; 5 per cent Fe and 5 per cent Zn. In this ore the silver, existing as chloride, seems to be in the interstices of the smaller joint planes of the lime, and for that reason it is sampled with difficulty. In screening the ore, the fines usually assay 15 to 20 per cent higher than the coarser fragments. In the lower grades an attempt was made to utilize this fact by screening the broken ore, using the larger and poorer fragments for mine filling and shipping the fines. This peculiarity has not been observed in any of the other limes, and least of all in those grades where the lime contents are exceptionally high. In these latter cases the silver chloride seems to be uniformly disseminated throughout the whole of the limerock; and, after screening, the fine material assays the same as the coarse.

The lime ores found in the regions of the lower levels of the lead stopes are high in lime (usually over 35 per cent. CaO) and seem to be, to a great extent, deposited as an ore body of approximately regular shape, with fairly well-marked boundaries.

The lime deposits in San Salvador show in places well-marked faults, along approximately north and south planes; and the presence of barren patches of limestone is very plainly observed. The character and mode of deposition of these ores in the eastern part of the camp is still very imperfectly understood; they run low in both silver and lime; and it is difficult to mine them with a margin of profit.

The contact deposits and the allied lime-silver impregnations beneath them, though scientifically interesting and economically valuable, are of minor importance compared with the lead-carbonate ore bodies found wholly in the main limestone formation.

The Sierra Mojada has always been regarded as a source of lead supply; and to-day probably two-thirds of the entire product of the camp is lead-carbonate ore from these last-mentioned deposits. The average assay of the lead ore, now mined at the rate of 120,000 tons annually, shows approximately 12 ounces of silver per ton and 15 per cent of lead. At several points the lead carbonate outcropped at the surface with nothing to obscure its presence; and a large number of the ore deposits now worked were opened up very soon after the original discovery of the camp. The lead-ore deposits are everywhere oxidized, and carry varying percentages of iron and silica, according to their respective locations. Between the San Jose and Jesus Maria mines the lead ores found near the silica contact ore are also siliceous in character, containing an excess of silica over iron. In San Jose generally, the lead-ore bodies deposited along the before-mentioned plane, parallel to and 120 feet south of the breccia contact, are high in silica (containing, as a rule, 20 per cent SiO_2, with a small excess of iron); but as the ore bodies are opened up toward the south and farther from the contact, the silica is gradually diminished and the iron increased. In the Lagartijo lead stopes, the farthest from the contact in San Jose, the iron is usually from 50 to 60 and the silica from 3 to 5 per cent.



5.—N.—S. SKETCH-SECTION THROUGH THE JUAREZ SHAFT, DIONEA MINE.

In San Salvador, in the east part of the camp, the northern ore body contains from 20 to 25 per cent SiO_2; 10 to 20 Fe; 20 $BaSO_4$; 3 CaO; and 5 Zn. The southern and principal ore body contains 10 per cent SiO_2, with from 25 to 50 iron oxide, and little or no barium sulphate. In the Volcan Dolores Mine, on the contrary, the section of which is similar to that of Esmeralda, the southern part of the ore deposit is more siliceous than the northern, offering thus marked contrast to the previously-mentioned cases.

The lead-ore deposits are practically continuous along the foothills of the Sierra Mojada Range for more than 2.5 miles from east to west. Towards their western extremity, in the Exploradora Mine, they are found at or near the contact of the lime and breccia; but towards the east they gradually recede from the contact, until, in the Fronteriza Mine, they are a long distance south of it.

The lead-ore bodies follow to a limited extent the planes of stratification of the limestone, which is nearly horizontal in San Jose and Jesus Maria, but much steeper near the Volcan Mine and in the Esmeralda ground. As a whole, the formation dips slightly southeast, and the lead-ore deposits, towards their eastern limit, are more than 1,000 feet below the surface. In the San Jose Mine, the zone of alteration, and apparent faulting or disintegration of the limestone, previously described south of the contact and parallel to it, has yielded an immense quantity of lead carbonates, which had been deposited in the zone of disintegration.

The horizontal ore bodies, or sheets of ore, extending southward from this zone, have also supplied for many years a large tonnage of lead carbonates annually. In the upper level of the San Jose Mine, where the limestone outcrops at the surface, the isolated horizontal deposit known as the Lagartijo has been found. Its connection with the zone of deposition mentioned above as lying parallel to the contact has evidently been removed by erosion.

In the eastern part of the camp, at the San Salvador Mine, work has been carried on, since the discovery of the camp, in an ore body lying some distance south of the contact. Along the western boundary of San Salvador the ore outcrops at the surface in a creek bottom; and it is continuous eastward throughout the whole of the mine, gradually receding from the contact and appearing at greater depth. From the east boundary of Salvador it extends through the Encantada, and a considerable distance into the Fronteriza Mine, attaining a total length of 4,500 feet. On the Salvador-Encantada boundary it is 450 feet, and on the Encantada-Fronteriza boundary 750 feet, below the surface.

A noticeable peculiarity in the eastern part of the camp, particularly in the Salvador Mine, is the presence of a shattered and completely broken-up limestone roof over the lead-carbonate ores. This shattering appears to have been due to the collapse of the enormous roof after the reduction in bulk of the ore body, due to oxidation. This disintegration is in places so complete that the lime over a considerable area is made up of small angular fragments, which sometimes run into the stopes like very coarse sand.

In addition to the ores actually mined, all the ore-bodies contain immense quantities of low-grade material and iron oxides. The sections show simply the shape of the ground as mined, and do not accurately show the size and extent of the complete deposits. The higher-grade ore is not by any means continuous throughout the ore deposits; and as cheaper mining and lower freight and treatment rates permit poorer ore to be handled with profit, it has been not uncommon to find large and valuable ore bodies of great size, which were entirely overlooked when the ground was first prospected. In several of the mines ore bodies of considerable size have been opened up, years after careful exploration, two or three times renewed, had been made, in poor vein-matter only a few feet away.

The Sierra Mojada ore bodies, like most of the lead-ore deposits in limestone in northern Mexico, appear to have been completely oxidized. They are usually roughly horizontal, forming interstratified ore sheets varying in thickness from 2 to 40 feet. Pipes or pendant columns of ore are often found, extending from the floor of the normal ore bodies downward to a depth of sometimes 200 feet. These chimneys are more common towards the eastern part of the camp than elsewhere. They often contain from 5,000 to 10,000 tons of lead-carbonate ore in their upper portion; but as depth is increased the contents gradually change, until very little lead or silver remains, ores of these metals being replaced by low-grade siliceous iron oxides. These, in turn, gradually pass into siliceous clay, below which the unchanged limestone is found in all directions from the bottom of the hole or pipe. In some of the lower levels of the mine, masses of zinc carbonate have been found; but the presence of zinc sulphide is nowhere prominent. No gold is found in any of the mines. In the lead deposits very pure lead carbonate is often found associated with large masses of native sulphur and gypsum, both very pure. The segregation is so noticeable that pure gypsum is looked upon as a valuable indication of the proximity of ore. Many carloads of native sulphur have been shipped to the United States for chemical purposes; and much more has been burned off from the ore in open piles, to make the grade of the lead carbonate residue high enough for profitable shipment.

Sulphides are encountered in small quantities, usually around the boundaries of the ore deposits. In the deepest ore bodies hitherto discovered in the camp (in the San Jose and Fronteriza mines), there is no appreciable increase in the relative quantity of the sulphide ore.

V. *Methods of Mining.*—For a number of years after the discovery of the Sierra Mojada the ore was mined by a pillar-and-stall method, poorly adapted to ore-bodies showing such marked irregularities in roof and floor, and, at all times, such large dimensions in every direction. In several instances, although the ore-bodies were fairly well exposed, the whole mine had become dangerous to work before 20 per cent of the ore in sight had been extracted. The Mexican owners and operators finally reached a point where they were no longer sure of being able to continue operations. At that time the use of lumber was almost unknown, and its very great cost was considered as prohibitive. It must be admitted that these early methods, which were chiefly confined to following the best ore-streaks, were very successful in discovering and opening up a very large portion of the ore. In several of the mines very little ore has been discovered which was not originally opened up by the first owners; subsequent economies and successes having been effected by more efficient methods of handling and treating the ore. The isolated deposits, however, and the contact-deposits not outcropping at the surface, have practically all been discovered in later years, since the older methods of prospecting did not include cross-cutting and driving in barren ground for purposes of investigation.

Shortly after Mr. Chism's description was written, in 1887, an American corporation, the Consolidated Kansas City Smelting and Refining Company, undertook to work several of the mines, under lease from the owners. Texas lumber was shipped into the camp, via Escalon on the Mexican Central Railroad, 75 miles away, at a cost, laid down at the mines, of $40 to $45 United States currency per 1,000 ft., board measure. Square-set methods of mining and timbering were introduced. Experienced timbermen from Colorado were employed at first to put in the sets; but the Mexican miners themselves finally became so skilful that of late years practically all the timbering has been done by native labor. A few years after taking over the mines the American operators built from Escalon to the camp a railroad, which has been one of the most prosperous enterprises in the Republic.

With the introduction of American methods of mining, it was found profitable to re-work the old and but partially exhausted stopes throughout their entire extent. On account of the large size and the softness of the lead-ore bodies, the cost of mining has always been low; and by the introduction of square sets of timbering, carefully filled with rock, the old workings have been kept accessible to a remarkable degree. In the eastern part of the camp the limestone roof over the lead-ore deposits was found to be completely broken up and disintegrated, resembling in its treacherous character an overlying quicksand. In timbering up to this roof the greatest vigilance was required to prevent a "run," and, in spite of all precautions, a large amount of sandy limestone would often find its way through openings between the timbers. In some instances, men were buried and suffocated by such irruptions of lime-sand; to prevent which, a thin crust of lead-carbonate ore was, at times, left to assure the solidity of the roof. Recently nearly all this ore has been extracted. Square-set timbering is now very generally employed in the extraction of the ore. The criticism has been made that caving methods should have been inaugurated, and the opinion has been expressed that if a system of regularly caving the roof of the lead-ore deposits had been adopted, instead of the rock-filled square sets, an increase in both safety and economy might have been effected. Subsequent work, however, has completely vindicated the advantages of the square-set method of timbering for this ground. Since the earlier operations, when only ore of much better grade was mined than is the case to-day, it has been found possible to re-work with profit (in some instances three or four times) the ore-bodies in all the mines, because they contained immense quantities of mineral of lower grade than could have been utilized at first, which successive reductions in freight- and treatment-rates gradually rendered available for profitable extraction. Under the "caving" system these low-grade bodies would not have been economically accessible.

In many of the stopes the square sets had been filled, not with lime-rock from the surface, but with low-grade ore from the old workings; and in many cases this filling has been entirely removed and shipped. Moreover, the square-sets, though often crushed and to a great extent demolished, have always permitted exploration work around them in all directions, and the ground has been re-worked at a price, and with a facility, which would have been impossible had it been permitted to cave.

The first tiers of sets were laid on the lowest profitable horizon of the stopes; and the timbering was gradually carried upward in a series of vertical slices toward the roof. When the whole area of the ore-body had thus been gradually and completely mined (in some cases over a horizontal extent of 10 acres, and with more than 24 sets from floor to roof), the whole superincumbent weight of limestone had to be supported. It was only by careful and thorough rock-filling that security was obtained and collapse prevented. Since then, much ore of profitable grade has been discovered to be below the old square-set stopes, and thousands of square sets have been sunk from the old sets by hangers. To-day, no difficulty is found in safely mining an ore-deposit of hard or soft ore lying directly under a worked-out and filled stope, where the overhead pressure is very great indeed; and the additional quantity of timber required is very small. The method employed is to sink one line of sets vertically to the lowest point where stoping is to be re-commenced. These sets are suspended from 10 by 10-in. beams, 16 feet long, reaching over three or more sill-pieces of the old sets. The new sets to be sunk are hung from these beams by pieces of 3 by 6-in. lagging nailed to the new sills, and the overlying 16-ft. stringer. After the new floor is reached (which may be 6 feet or 60 feet below the old floor), new sets are thrown out horizontally, using the initial column or columns of suspended sets with hangers, as winzes or manways. The new sets are started in the usual way, being filled with rock, and gradually tied up to the old upper sets as the work proceeds. The San Salvador Mine (where over 1,000,000 tons of ore has been mined from what is practically one continuous ore-body) and the lead-ore deposits in the San Jose have all been re-worked once, and in some cases two and three times, a large proportion of the output having been obtained by re-opening and continuing in every direction old square-set stopes. It is certain that much of this ground could never have been cheaply prospected and re-examined, and thereby made available, under any other system of timbering.

The last-mentioned method is employed in the mining of soft lead carbonates, often sandy in character, and usually with a soft roof or floor, or both,

composed either of low-grade iron oxides or rotten lime-stone. In mining the lime-ores an entirely different proposition has to be faced.

In the lime stopes, which are always hard, very large chambers, 60 by 100 feet or more, can be opened up with safety. Finally, however, it is found desirable to support the roof on account of the very large area exposed. The distance from the floor to the roof exceeds, at times, 75 feet, and attempts have been made to support the latter by a large number of 12 to 14-in. posts, filling in the spaces between the posts with waste rock, as the roof is gradually stoped away. A space of from 6 to 8 feet is left between the ore in the roof and the filled floor. As the posts are gradually buried, new ones are placed upon the old ones or upon the rock-filling, and the roof is carried upwards. This method has not proved altogether satisfactory, and is now seldom employed. The floor of the stope is usually not absolutely barren, but simply is of too low a grade to be mined. Later, when it is desired to prospect or work below, to obtain information, the ground filled by this method is much less accessible and more costly to reopen than a stope filled with square-sets. For this reason square-sets are generally employed in the lime-stopes, although they are not usually put into place until the stope is of large size. A large number of sets are then put up at once, from floor to roof, and solidly filled with waste rock. The space around the margin of the stope is usually left open for sampling. The square-sets are used here as a holder or framework for the column of waste rock which supports the roof. As the lime-ore is usually of low grade, leaving a very small margin of profit for mining, it seems a pity to spend for timber 75 cents United States currency per ton of ore mined; but hitherto no more desirable method has been suggested which will compare with this in efficiency.

In the lead-ores lying completely in the lime-stone, prospecting is almost unnecessary. An immense sum of money which has, indeed, been spent in driving barren lime, looking for lead-ores, has simply been thrown away; since the ore found has finally proved to be a part of some deposit already worked some distance away. The time-honored maxim which advises the miner to "stay with his ore" applies with great force in this locality. The reductions of recent years in freight- and treatment-rates have enabled ore to be mined at a profit which could not be touched before; and this has been the principal factor in maintaining the prosperity of the camp. The mining of low-grade deposits has resulted again and again in the discovery of ore-shoots of higher grade, entirely separated by zones of low-grade mineral from the deposits formerly worked. This is a very encouraging feature attending the mining of low-grade fluxing-ores, which in themselves leave only a minimum profit to the miner. In such ground there is no better way to expend money on investigations than to follow the low-grade shoots of iron oxide, fissures or cracks in the lime, or the numerous caves that are continually discovered in the vicinity of the ore-bodies. Large bodies of gypsum are also frequently met near the lead carbonates, and are considered to be guides worth following.

The lime-ores are much more difficult to prospect than the other classes. Even when found near the contact, they are often separated from it by a rib of barren lime several feet thick. The lime-impregnations are often suddenly faulted or cut off by strips of barren lime-rock, sometimes only a few feet thick, after which the ore is again encountered. The slips often cause the abandonment of a stope for several months, until work in other stopes gradually opens up ground in the vicinity and shows the direction of the lost ore-shoot. There is often nothing in the appearance of the lime-ore to indicate whether it is of high-grade in silver or quite barren, and vigilant daily sampling and assaying is necessary to maintain the grade and tonnage of the output.

In several of the older mines the contact has been carefully and systematically explored by a series of levels and winzes, analogous to the methods of ordinary vein-mining; but towards the northern and eastern portion of the camp it is still almost entirely unexplored. A large number of diamond-drill holes have been sunk through the conglomerate and breccia to the lime-contact, and at times into the lime below; but the total result up to date has been of a negative character. In spite, however, of the barren result of drilling-operations, it is impossible to doubt that large ore-bodies will yet be found on this contact-plane by further exploration.

Towards the eastern part of the camp a lead-carbonate deposit, wholly in the limestone, assaying 5 ounces silver; 20 per cent lead; 40 per cent iron; 3 per cent silica, and 5 per cent zinc, has been opened in the Fronteriza Mine, at a depth of 800 feet. The relative small area of this body and its great depth lead the writer to believe that, beyond this mine, the chances of profitable mining operations upon it are not good. In the future the mines with lead-carbonate deposits on or near the contact will probably find extensions below their present lower levels, since these bodies run southward more or less horizontally, and there is nothing yet to indicate the absence of ore-deposits at lower levels than those now exploited.

In nearly all the mines the ore is hoisted to the surface through vertical shafts, some of which have noticeably small dimensions (one being 3 by 4 feet inside the timbering). In the Dolores Mine, where the ore is in a flat sheet, dipping south, it is hoisted up an underground incline, and from the surface is let down by a surface-incline to the railroad-switch. The two inclines are coupled together, and enough power is obtained from the surface-incline to work the mine-incline automatically. The mine-incline is 360 feet long, and has a fall in this distance of 114 feet. The surface-incline is 1,070 feet long, with a total fall of 184 feet. The cost of hoisting the ore to the surface and lowering it again to the railroad is 10 cents Mexican money per ton. On the underground incline a 2 by ⅜-in. flat rope, and on the surface-incline a ⅝-in. round steel rope is used. The ore handled by this method is of very low grade, but the mining expenses are kept at a low figure; the economy effected by the double incline is the only condition which has made it possible to operate the ore-deposit. During 1900 this incline handled 15,000 tons of ore.

On account of the very large quantity of timber in the mines (nearly 4,000,000 feet being used annually at prices varying between $25 and $30 United States currency per 1,000 ft.), every precaution is taken to prevent fire. The use of steel candlesticks is enforced, and fire-bosses are employed who have no other duty but to look out for signs of fire. In spite of these precautions, serious fires have occurred. One in the Veta Rica Mine, in April, 1899, started in a lime-ore body adjoining the breccia-contact, which was filled with square sets. The fire rendered the mine inaccessible for several months; large caves of the overlying contact material took place, and serious loss was incurred.

Originally, Texas and Louisiana long-leaf yellow pine was the only timber used, on account of its great strength and fiber; but it has become fully recognized by experience that square-sets, as such, are of but little use where really heavy pressure has to be resisted, except when carefully and promptly filled with waste rock. A much poorer grade of native lumber is now used, purchased from Durango at a cheaper rate than that paid for United States lumber, and filled as soon as conveniently possible after setting up. It is a question whether additional profit could not be made by using larger sets, since, on account of the low price of unskilled labor ($1 Mexican money or 50 cents United States currency per day), the rock-filling can be done extremely well and cheaply. The cost of timber in the Sierra Mojada is approximately 50 cents United States currency per ton of ore mined.

Among the interesting features of the camp are the large earthern storage-reservoirs for water, which have been built at various points by the mine-owners or operators. A small settlement of miners is usually found near each tank. At times these reservoirs become quite dry; and although the wells do not fail, they are so deep, and the supply is so limited, that it is more economical to bring water in by the railroad, from points along the Mexican Central Railroad. Nearly every year a considerable quantity of water is shipped into the camp at a cost of from $2 to $4 Mexican money per 1,000 gallons.

Labor for the mines is fairly abundant. The Sierra Mojada miner earns usually $1.50 Mexican or $0.75 United States currency per day. He is industrious and intelligent, and will mine and timber in the heaviest ground with skill and confidence. The loss of life in the Sierra Mojada mines is very small, presenting in this respect a marked contrast to several other camps in Mexico. This is perhaps due, to a considerable extent, to the fact that many of the foremen and superintendents are American or Europeans, and, by reason of their position as aliens, are compelled to take every precaution against accidents for which they might be blamed.

The climate of the camp cannot be surpassed. The almost entire absence of clouds and rain throughout the year; the clearness and purity of the air; the absence of cold winters and hot summers—all combine to make the place attractive in spite of its desert surroundings.

THE REMOVAL OF IRON FROM ZINC BLENDE

By Dr. Wm. B. Phillips.

In the issue of the Engineering and Mining Journal of April 6, 1901, I described briefly the situation in Sevier County, Ark., with respect to some of the zinc properties. Since that time additional information has been gathered and many experiments have been conducted with a view of separating the iron-bearing compounds, such as pyrite and chalcopyrite, from the blende. These experiments have been, for the most part, in the direction of magnetic separation, as it was found that the jigs did not effect as clean a removal of the iron as was desired. With this class of zinc ore, carrying pyrite, chalcopyrite and galena, it is possible to separate the lead compounds by jigging and the use of a classifying table, such as the Bartlett, etc., but the iron-bearing compounds cannot be thus separated and they pass over with the final zinc concentrates. Furthermore some iron is carried in the darker varieties of blende molecularly combined for the lighter colored blende (amber jack, resin jack) contains considerably less iron than the black jack. So far as concerns the iron we find it, then, in three conditions, as pyrite, as chalcopyrite and as a molecular compound in the blende.

Considering that the main obstacle to the preparation of clean blende was the iron in the condition of pyrite and chalcopyrite, tests were carried on to eliminate this from the final zinc concentrates from the jigs, leaving the questions of the removal of the galena and the utilization of the copper for the future. There is but little difficulty in recovering the galena; the recovery of the copper may present some interesting problems.

In one of the trials, zinc concentrates of fairly good quality were used. They contained 56.44 per cent zinc, 5.05 per cent iron and 1.14 per cent copper. From this material it was found possible to secure 83.26 per cent of material carrying 60.86 per cent zinc and 1.32 per cent iron. The tailings were 11.43 per cent and contained 12.23 per cent zinc, 43.67 per cent iron and 9.08 per cent copper. The middlings were 5.31 per cent. but were not

analyzed. The original material was roasted, but the percentage of sulphur was not given, either for the raw or the roasted stuff. Analyses were made by the Magnetic Separating Company, Joplin, Mo. In another trial, using a different type of separator, the analyses were made in more detail. The following table, No. 1, shows the character of the ore tested and the results reached.

TABLE 1.

	Per ct. of yield	Zinc	Iron	Copper	Lead	Silica
Roasted Ore		51.03	5.09	1.2	0.92	8.6
Through 8 on 24 Mesh. Heads....	27.70	60.04	1.82	0.39	0.94	2.92
Middlings	1.80	18.79	26.75	7.12	1.44	8.68
Tailings..	3.80	5.69	40.45	3.04	0.33	10.42
Through 24 Mesh. Heads....	52.4	56.64	1.60	0.30	0.79	10.57
Middlings	9.0	40.13	8.13	3.90	1.84	14.64
Tailings..	5.3	10.22	35.95	7.62	1.19	7.75
Combined Heads..	80.9	57.8	1.67	0.33	0.83	7.9
" Middlings .	10.9	36.6	11.25	4.40	1.70	13.6
" Tailings ..	9.0	8.3	37.90	5.70	0.83	8.9

Analyses by Ledoux & Co., New York.

It will be observed that the combined heads amounted to 80.9 per cent of the original ore and that they carried 57.8 per cent zinc and 1.67 per cent iron. The middlings would be re-worked inasmuch as they contained 36.6 per cent of zinc. The amount of zinc in the tailings is too low to admit of profitable treatment over a magnetic machine, but the tailings could be treated for zinc and copper, chemically or electrolytically. The results of this test were so favorable that another was undertaken, and this time with one of poorer quality, no attempt being made to divide the product into more than two classes, heads and tailings. A jig product was taken carrying 48.00 per cent zinc, 1.00 copper, 1.80 lead, 6.71 iron, 10.00 silica and 31.45 per cent sulphur. It was gently roasted to remove a portion of the sulphur and then passed over a magnetic separator at 110 volts and 6 amperes, the rate of feed varying from ½ ton per hour to 6 tons per hour. Table 2 gives the nature of the original ore A, the slightly roasted ore B, and the results of treating B, at different rates of feed, from ½ ton to 6 tons per hour.

TABLE 2.

	Ore B. i. e. Ore A. slightly roasted.						Pole 1 and 2.				6 amperes.		110 volts	
	Ore A. Orig. material.	Ore B. i.e. ore slightly roasted	Rate. ½ ton per hr. 14.40% 85.60% Mag. heads	Zinc conc.	Rate. 1 ton per hr. 11.90% 88.10% Mag. heads	Zinc conc.	Rate. 2 tons per hr. 10.81% 89.19% Mag. heads	Zinc conc.	Rate. 3 tons per hr. 10.09% 89.91% Mag. Zinc heads conc.	Rate. 4 tons per hr. 9.54% 90.46% Mag. Zinc heads conc.	Rate. 5 tons per hr. 9.15% 90.85% Mag. Zinc heads conc.	Rate. 6 tons per hr. 9.09% 90.01% Mag. Zinc heads conc.
Zinc	48.00	49.50	10.50	53.00	7.50	54.50	8.50	56.00	5.50	56.00	6.50	58.00	5.50	55.00	8.50	55.00	8.50	55.00
Copper	1.00	1.50	5.20	none	6.00	none	3.50	none	1.50	none	4.25	none	4.10	trace	3.60	trace	3.60	trace
Lead	1.80	3.00	1.00	0.80	0.40	0.40	0.60	0.60	0.60	0.80	none	0.60	0.20	0.60	0.60	0.60	0.60	0.60
Iron	6.71	6.38	34.54	3.30	26.84	1.54	45.98	1.76	42.13	1.87	39.89	1.65	43.78	1.65	43.45	1.65	43.45	1.65
Silica	10.00	10.68	27.10	20.00	20.40	7.68	13.68	8.56	13.88	11.84	14.00	12.60	17.42	22.04	12.40	8.30	12.40	8.30
Sulphur	31.45	22.81	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Anal. No..	1,274	1,275	1,277	1,278	1,279	1,280	1,281	1,282	1,283	1,284	1,285	1,286	1,287	1,288	1,289	1,290	1,289	1,290

TABLE 3.

	Ore C. i. e. Ore A. more strongly roasted.						Pole 1 and 2.				6 amperes.		110 volts.	
	Ore A. Orig. material	Ore C. i. e. ore A.more strongly roasted	Rate. ½ ton per hr. 18.99% 81.01% Mag. heads	Zinc conc.	Rate. 1 ton per hr. 15.09% 84.91% Mag. heads	Zinc conc.	Rate. 2 tons per hr. 14.32% 85.69% Mag. heads	Zinc conc.	Rate. 3 tons per hr. 13.41% 86.59% Mag. Zinc heads conc.	Rate. 4 tons per hr. 12.71% 87.29% Mag. Zinc heads conc.	Rate. 5 tons per hr. 12.19% 87.81% Mag. Zinc heads conc.	Rate. 6 tons per hr. 12.14% 87.86% Mag. Zinc heads conc
Zince	48.00	50.00	18.50	56.00	17.00	58.60	17.50	56.00	19.00	48.50	16.00	47.50	16.50	51.00	25.50	55.00	25.50	55.00
Copper	1.00	2.30	1.30	trace	4.00	0.70	4.65	0.50	5.50	9.30	4.20	2.30	3.20	2.60	7.00	6.00	7.00	6.00
Lead	1.80	0.80	1.60	none	0.60	0.20	2.00	0.40	1.80	0.20	1.80	0.60	2.20	none	0.20	2.00	0.20	2.00
Iron	6.71	6.49	27.39	1.65	34.54	1.76	34.32	1.76	34.54	1.87	35.75	2.08	34.87	2.31	34.76	1.87	34.76	1.87
Silica	10.00	12.32	19.86	9.24	21.24	10.76	18.34	10.60	21.02	10.36	20.56	9.88	19.48	13.24	18.80	12.92	18.80	12.92
Sulphur	31.45	16.72	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Anal. No..	1,274	1,276	1,291	1,292	1,293	1,294	1,295	1,296	1,297	1,298	1,299	1,300	1,301	1,302	1303	1,304	1303	1,304

It will be observed that the slower feed not only gave a smaller yield of zinc concentrates (and therefore a larger yield of magnetic heads) but that the content of zinc in the concentrates was less than in any of the other products, yielded at faster speeds. It would appear from this that the tumbling motion, so important in the magnetic separation of iron ores, is also of importance here, for the slower speed would certainly tend to preserve the particles of ore, etc., in an uninterrupted position, and consequently to expose the particles to the influence of the current only in one direction. As the machine was of the so-called magnetic permeability, or saturated field type, the lines of force were distributed approximately along the same course, and this was evidently not sufficient to effect as good a separation as was desired. The best results were at a speed of 4 tons per hour, when 90.46 per cent of the ore treated came over as zinc concentrates containing 58.00 per cent zinc, no copper, 0.06 per cent lead, 1.65 per cent iron and 12.60 per cent silica; while there were 9.54 per cent of magnetic heads containing 6.50 per cent zinc, 4.25 copper, no lead, 39.89 iron and 14.00 silica. This is certainly an excellent result. Including the low zinc in the product of the slowest speed the average content of zinc in all the products classed as zinc concentrates is about 55.5 per cent. Excluding this the average is about 56 per cent, while there is a possibility of bringing the zinc up to 58 per cent, as in analysis 1,286. It would appear to be entirely feasible to secure from 88 to 90 per cent of the gently roasted ore as concentrates carrying from 56 to 58 per cent of zinc, with iron not above 1.75 or 1.80 per cent. Whether the zinc in the concentrates can be brought above 58 per cent remains to be seen, but this would be difficult with material containing, in the roasted condition, less than 50 per cent zinc. Still another test was made, the original ore being more strongly roasted, the sulphur falling from 31.45 to 16.72 per cent. The results are given in Table 3.

It would appear from these results that there is a positive disadvantage in strongly roasting the ore, for the percentage yield of zinc concentrates is diminished, the loss of zinc in the magnetic heads increases, and there is a tendency toward a lower zinc content in the concentrates. So far as concerns this latter point exception must be made of analysis 1,294, which shows 58.60 per cent zinc in the product given by a rate of feed of 1 ton per hour, but this was accompanied by a yield of 15.09 per cent of magnetic heads, carrying 17.00 per cent zinc. The average zinc content in all the concentrates from the more strongly roasted material is about 53.2 per cent. The more serious consideration, however, is the high zinc content in the magnetic heads, due, doubtless, to the entanglement of zinc oxide in the magnetic material. By a stronger roast there may be, also, a loss of zinc as oxide. From these results it may be concluded that it is not necessary to remove more than one-third of the sulphur in roasting.

The situation of the Sevier County zinc mines, within easy reach of the Kansas City Southern Railway, which enters the Beaumont oil district, would seem to be favorable for the introduction of oil as a fuel for the roasting furnaces. The success of magnetic separation as applied to these ores will depend very largely upon the roasting, for if the product sent to the machines from the roasting furnaces is not suitable, no profitable results can be anticipated. The regulation of the temperature during the roasting operation and the uniformity of the roast condition the success of the subsequent operation. It follows from this that too much care cannot be given to the preparation of material suitable for the machines. Insufficient roasting tends to throw entirely too much iron into the zinc concentrates, while over-roasting throws too much zinc into the magnetic heads, so that neither in the one case nor in the other is there a profitable concentration.

While the ores of the district bear a general resemblance to each other yet there are differences to be observed and some of these maintain also in the same vein. There are differences in the closeness of association between the blende, the pyrite and the chalcopyrite, between the pyrite and the chalcopyrite, between the barren material and the pay streak, between the varieties of the blende itself. All of these will have to be considered in the operation of the plant and it is only after experience has been gained in every day work that the best results can be reached. So far as my observation goes, all of the zinc ores in this part of Sevier County carry both pyrite and chalcopyrite and the content of iron may be as high as 7 per cent, chiefly in the form of pyrite. This must be removed before the blende can be marketed at a profit and there seems to be no way of doing this except by some process of magnetic separation. This can be applied only to material that has been roasted so as to bring the iron-bearing compounds within the range of the current operating within the so-called saturated field. That these ores are capable of being mined and treated at a good profit admits of no doubt.

There are other interesting ores in Southwest Arkansas, as for instance antimony and gold. I have recently had a specimen of gold ore from that part of the State which carried 1.843 ounces of gold and 366 ounces of silver per ton, while a sample of galena carried 71.50 per cent of lead, with 6.75 ounces of silver and 1.2 ounces of gold. The country is well watered and well timbered, the climate is all that could be desired for at least ten months in the year and there is a disposition on the part of the railroad interests to further all legitimate development.

The developments that have been made at the Bellah Mine and the old Davis Mine, west of Gilham, show that the ore bodies are strong and persistent, occupying true fissures and maintaining a regular mineralization. The zinc ores carry but little silver or gold, but in places do carry enough copper to make its recovery an important consideration. So far all the work has been directed to bringing the zinc up to as near 60 per cent as possible, the removal of the galena and the chalcopyrite being merely incidental. But the treatment of these ores should be based on the recovery of all the marketable ingredients, not only the blende but the galena and the copper compounds as well. The main thing just now is to clean the blende; this done there will be opportunity for considering the other questions.

GOLD IN FRENCH GUIANA.—According to a recent official report there were 11 concessions for gold mining in force in French Guiana, of which only four were regularly worked. One of these is operated by the Societé des Placers Enfin and three by the Societé des Placers St. Elie. In addition to these concessions there were 325 prospecting licenses in force, under most of which men were at work prospecting or working small placers.

THE LIQUEFACTION OF HYDROGEN.—A note by Mr. M. W. Travers, as abstracted in the *Transactions* of the British Institution of Civil Engineers, gives an account of the method whereby the author has succeeded in obtaining liquid hydrogen in quantity. The apparatus consists essentially of a modified Hampson air-liquefier. The hydrogen, at a pressure of 200 atmospheres, undergoes a preliminary cooling to — 80° C. in solid carbonic acid and alcohol. It is then successively cooled by liquid air boiling under atmospheric pressure, and under a pressure of 100 millimetres, after which it escapes from the Hampson valve, and being sufficiently imperfect gas at the low temperature (— 200° C.) obtained by the liquid air boiling under low pressure, regenerative cooling is produced, as in the liquefaction of air by the Hampson machine, and liquid hydrogen is obtained. It is collected in a vacuum vessel which is sepecially insulated from external heat.

THE KLEIN JIG AND CLASSIFIER.*

By Ferdinand H. Regal.

The general form of the jig devised by Mr. John Klein, which is in use in the lead district of Southeast Missouri and in the Phillipsburg District in Montana, is of the inverted pyramid type, resembling the Hartz jig. Certain advantages over the Hartz jig are claimed for it, however, that it requires less power, has greater capacity and effects a cleaner separation. In this jig any number of plungers may

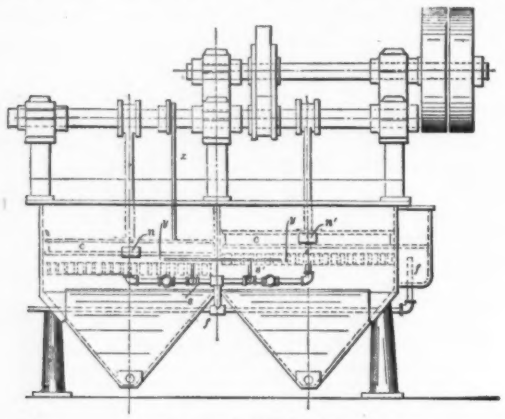


FIG. 1.—KLEIN JIG.

be operated by one eccentric, the method adopted being illustrated in Fig. 2; where *a* is the eccentric and *b* the rocker operating the plungers *c c'*.

The use of compressed air plays an important part in the operation of a Klein jig. The main advantages claimed are an increased product, and a cleaner product as compared with that of a machine in which water alone is the concentrating agency. In Fig. 1 the space(*f*) acts as an air-receiver. An air-pipe

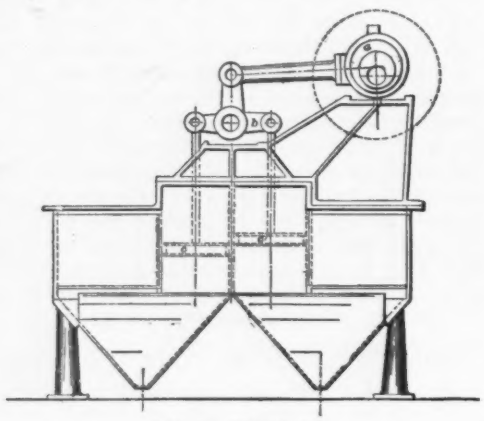


FIG. 2.—KLEIN JIG.

(*f-f*, etc.), leading from this receiver, is run directly under the ore caps below *n* and *n'*. The whistle valves, *s s'*, on this pipe, operated through *x* and *y-y* by an arm from the rocker shaft, regulate the admission of air. With every stroke of the plunger a puff of air is forced up through the ore cap, effecting a clean and regular output of concentrates through the gates, *n* and *n'*. The usual pressure in the receiver varies from 25 to 35 pounds.

The eccentric can be regulated so as to give a throw of from 0 to 3 in., according to the class of ore to be treated. In Southeast Missouri, where only galena ore is concentrated, strokes of 0.625, 0.875 and 1.25 in. respectively, are employed for material of 4, 7 and 12 mm. grain; the number of strokes per minute averaging about 150.

At a plant in Southeast Missouri 27 of these jigs, of four compartments each, are treating from 450 to 500 tons of lead ore in 24 hours. A test run of several weeks was made on a lot of 2.5 per cent lead ore, which had been thrown aside; and the net returns showed an extraction of 90 per cent of the metal at a commercial profit.

Figs. 3 and 4 show respectively the front and size elevations of the Klein classifier. The housing of this machine is made entirely of iron, cast in one piece. This construction prevents leaks, and with it the pipe fittings will remain permanently in place, which is almost impossible with a wooden housing. Compressed air plays an important part in operating this machine, as with the jig.

The working parts of the classifier are as follows: In Fig. 3 the 1.25 in. pipes, *B, B*, connected with the 2-in. pipe *S* bring the main supply of water used in classifying the ore from a tank, elevated 15 feet above the classifier. As the ore, mixed with water, comes from the trommels, it passes into the receiving

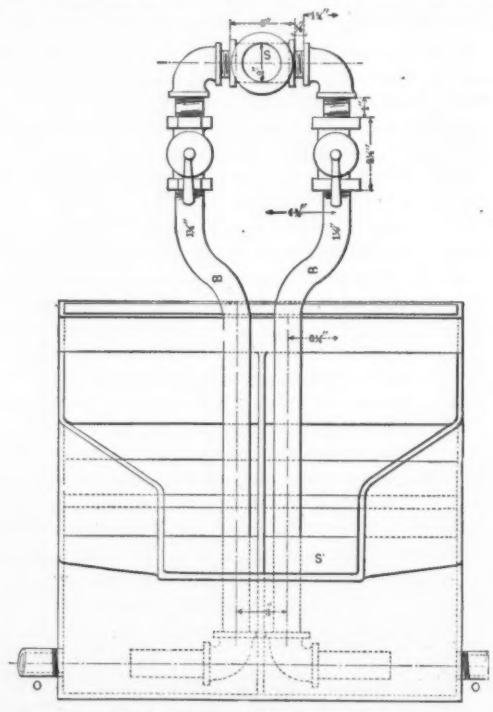


FIG. 3.—KLEIN CLASSIFIER.

chamber *R*, shown in Fig. 4. As this chamber fills, the material flows over into the compartment *M*, Fig. 4, in which the classification takes place. In this compartment there are a series of air-inlets, both on the sides and bottom. There are five air-inlets on the bottom, each of which is regulated by a globe valve. On the sides, air is inserted through the hood *H, H*, Fig. 4, with sprays of perforated copper (also regulated by globe valves), which blow directly against the water coming from pipes *B, B*, thereby causing a continuous agitation of the ore.

This use of air in combination with water is certainly a new departure in ore-classification; but it is, in the author's opinion, destined to become, in this branch of ore dressing, as common as the use of water itself. Every bubble of air, as it comes from the bottom of the classifier, carries to the top a certain amount of fine material, which is washed into the outlet *S'*, Figs. 3 and 4, while the larger particles, not thus acted upon, are left on the bottom, to find their way through the outlets *O, O*, Fig. 3 The air pressure required for the jigs will also answer very well for the classifier.

When these machines have once been installed, their maintenance is an easy matter. They can be regulated with much delicacy. The expense of repairs is reduced to a minimum by the simplicity of their structure; and, above all, they are easily tended.

Since the limits of this paper will not permit a thorough discussion of all details, United States Patents Nos. 674,169 and 674,269 (both issued May 14, 1901) may be consulted for a more complete description of these machines.

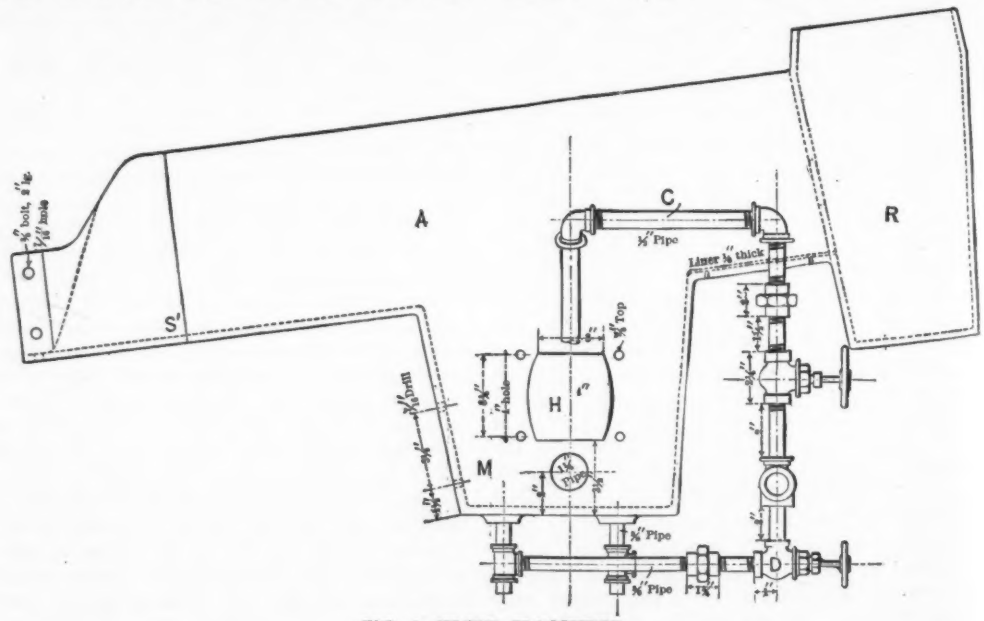


FIG. 4.—KLEIN CLASSIFIER.

SULPHUR IN NEW ZEALAND.—The New Zealand Mines Department reports the output of sulphur in the colony in 1900 at 1,692 tons, an increase of 465 tons over the previous year.

CALCIUM CARBIDE SYNDICATE.—Owing to overproduction in Europe, the International Carbide of Calcium Syndicate, composed of German, Swiss, Swedish, Austrian, and Norwegian works, has been dissolved. About 11 months ago the combination was formed to regulate production so that better prices could be obtained. At that time the annual output of these works was about 50,000 tons, while the consumption was considerably less. Moreover the situation was similarly unsatisfactory in Italy and France. An effort was made to close some of the works in order to lighten the stocks on hand, but the fall in consumption was appearently too heavy. It is now proposed, however, to form a new combination.

COAL PRODUCTION IN GERMANY.—The production of the collieries in the Westphalia District of Germany during the first nine months of the present year is less by 1,040,000 tons than it was during the corresponding period of last year; and this diminution, which is chiefly in the Ruhr Coal field, is attributed by the Essen correspondent of the *Organe Industriel* to the great development given to the collieries of this district, and to the circumstance that they are removed from all export markets, although the Rhenish-Westphalian Coal Syndicate is making every effort to effect sales in foreign countries. While the works belonging to the Dortmund Briquette Union produced 140,597 tons of briquettes in August last, the quantity for September fell to 129,950 tons. The Westphalian Coke Syndicate announces its determination to maintain, during the first three months of 1902, the present restriction of 33 1-3 per cent from the maximum production of the ovens.

*Paper read before the American Institute of Mining Engineers, Mexico meeting.

THE PACHUCA STAMP-BATTERY AND ITS PREDECESSORS.*

By M. P. Boss.

The invention of the arrastra for fine grinding is declared by some authorities to have been made by Bartolomeo de Medina, at Pachuca, Mexico, about A. D. 1557—which is quite probable. Being the first to amalgamate silver on anything like a commercial scale, he must have felt the necessity for ore-grinding apparatus of greater capacity than the old primitive millstones; and the arrastra was thus the natural successor of the millstone. It is very unfortunate that the archives of Pachuca, which have made so much history in ore-treatment, were destroyed in some one of the many insurrections for which, also, the place is renowned.

The first application of the stamp to the crushing of rock is asserted by some writers to have been the invention of a Saxon nobleman named Von Maltitz, about the year 1505. Better authenticated reference, however, is made to one Paul Gronstetter, a native of Schwarz, and called an ingenious worker, who, in the year 1519, established at Joachimsthal a process of wet stamping and sifting. Whether the stamp-mill was then practically used as we find it profusely illustrated in the work of Geo. Agricola, some years later, or whether it had been further developed by other hands in the interim, we are not informed. But for more than 300 years the stamp continued to be a square timber (except in a few instances, where square iron was used) with an iron shoe at the lower end. In this form it came to crush the first gold ore of California.

After outlining the development of the stamp mill in California, the paper says that 16 years ago the writer became an advocate of concrete foundations and low-set guides for stamps, and, three years later, took the opportunity to apply these principles to the original Hacienda de San Francisco, of Pachuca.

This first foundation, however, was not an unqualified success, the concrete having been insufficiently rammed; but it was a guiding star for the erection of the new Hacienda de San Francisco, built at Zotol. This mill began crushing ore in May, 1894, has been in practically constant operation ever since, and has made a record, in some respects very remarkable. It was built with 20, and in the following year increased to 30 stamps. During these seven years, only four stems, all told, have been broken, and one renewed; and the stems are not seriously worn in the guides. The stamps, when new, weigh 1,040 lbs. each, and make 102 drops per minute. Each stamp has therefore dropped about 450,000,000 times, without renewal of stem or guide. For this result three causes are assigned:

1. The long stamp-head and low guide prevent severe wrench to the stem when the stamp strikes hard at one edge of the shoe.

2. The solidity of the concrete foundations keeps the jar and vibration of the iron-work at a minimum.

3. The iron guides give the stem but little play.

At the Hacienda de San Francisco, now running, the concrete was laid upon solid bed-rock, and was 9 feet in depth and 9 feet in width. It was very thoroughly rammed as laid. On a hard bed-rock there is no necessity for deep concrete, except to secure the required height: in fact, no foundation could be better than a solid, unfailing granite bed-rock, with only a thin sheet of rubber or canvas between it and the mortar. With a mortar having a fairly thick bottom, this would make a perfect anvil for the blows of the stamps. The top of the stamp-head in the San Francisco is only 2 inches below the lower guide when the stamp has new shoe and die, and is raised 6 inches for drop. This, of course, requires that the housing shall be around the stamp-head instead of around the stem—which is easily effected with a long stamp-head.

Guides of iron themselves wear so little, and also wear the stem so much less than wooden guides, that they are beyond comparison better. For example, how thick would a stem be, after running seven years in wooden guides, without repairs or alteration in length? The reason that wooden guides wear the stem so much faster than iron ones is that they accumulate grit, whereas an iron guide becomes smooth and polished.

*Paper read before the American Institute of Mining Engineers, Mexican Meeting.

GEMS AND PRECIOUS STONES OF MEXICO.*

By George F. Kunz.

In this paper the author gives full and interesting details concerning the different varieties of gems and precious stones found in Mexico. It is impossible to abstract this part of his paper, and we can only give the general introduction, which is as follows:

Mexico has been famous for its silver mines ever since the Spanish conquest; but in respect to gems, although many varieties occur, yet only a few have been obtained in any important amount. Considering the extent of country in Mexico and in the adjoining States of the Central America Republic, and the richness of mineral wealth that must surely exist there, our present knowledge of the occurrence of precious stones is remarkably small. The great prevalence of igneous rocks would lead us to anticipate the future discovery of many localities of gems and ornamental stones, when fuller scientific exploration shall have taken place.

FIG. 1.—INTERIOR VIEW IN SMELTING DEPARTMENT, OLD SMELTER AT MORELOS.

At the present time the only gem-stone that is systematically mined in Mexico is opal, and the only important ornamental stone is tecali, the so-called Mexican onyx. In addition to these may be mentioned the pink garnet, or rosolite, found in one locality in the State of Morelos, where it is worked to some extent, and the pyropes or Bohemian garnet, weathered out of igneous rocks, and gathered by the Comanche Indians in Chihuahua, as those of Arizona and New Mexico, are collected by the Navajos. Other garnet localities are known, but have not been developed. Topaz occurs at some points, and will be referred to later. Also beautiful amethysts from Guanajuato are well known, but while making superb specimens for the mineral cabinet, they rarely afford material for cutting.

Great interest attaches to certain semi-precious stones that were used and highly valued in pre-Columbian Aztec times, but of which the localities have been lost, or only recently rediscovered. Prominent among these is the precious and even sacred *Chalchihuitl* of the Aztecs, at one time supposed to be turquoise, but now more properly identified with jade. Recent studies of the sources of this remarkable stone are referred to later. Another is a fine amethyst, different from that of Guanajuato, which was worked into ornaments by the ancient natives. A third stone, used to a great extent by the Aztecs, is obsidian, or volcanic glass. The wonderful chipping and lapidary skill shown in their work on this material in Mexico has never been equaled elsewhere. The principal locality where this obsidian was mined is known and has recently been described in detail, but there were doubtless other localities, as there are several varieties.

Of the rarer gems, diamond, ruby, sapphire and emeralds, few occurrences are reported, and none are being mined; reliable information about them is limited. Santiago Ramirez, in a work on the minerals of Mexico, published in 1884-85, *Noticia Historia de la Minerea de Mexico,* relates on the authority of another person, that in the Mexican war of independence, General Vicenzo Guerrero, while selecting a camping place for his men, in the State which now bears his name, but at a point not named, found some diamonds. Their mode of occurrence, however, as described, makes it almost certain that they were only brilliant crystals of quartz. They are described as having been found loose in the interior of large hollow pebbles, and were, in other words, geodes. Some of them are said to have been set in earrings, and to have been pronounced octahedral diamonds, and others to have been purchased by a lapidary at the capital. But the accounts are vague; though one specimen, of three carats, is said to have been presented by Gen. Guerrero to the museum of the Mexican College of Mines. If this crystal could be found and identified, there would be a clear understanding of the facts.

Ruby has never been definitely found, though it has been reported from Durango, and at one or two other points; however, it is not at all certain that these specimens were not pyrope garnets. A single rolled pebble of blue and white mottled corundum is the nearest approach to sapphire yet obtained. It was brought from near San Geronimo, Oaxaca, by Dr. Knight Neftel, of New York, and identified by the writer. It occurred among pebbles of agate and chalcedony.

Emerald, or perhaps only a finely colored beryl, is reported from three points—the hill of Cerro Gordo, in Guanajuato; and in the State of Hidalgo, near Tulancingo, at Tejupilco, and is found in mica schist; and a few small specimens of good color, but imperfect, are in the Escuela Minera Nacional, and bear the label of a locality in the State of Guerérro.

*Abstract from paper presented to the American Institute of Mining Engineers, Mexican meeting.

THE RAYAS AND MELLADO MINES, GUANAJUATO, MEXICO.

A subscriber sends the following interesting historical notice of two famous Guanajuato mines, which was originally prepared for the *Opinion Libre,* of Mexico.

Sebastian de Aparicio, foreman of cart trains who years afterwards became a monk and was canonized by Pius VI. in 1790 and died in Puebla in the year 1600, was the first man to survey and build a road from Mexico City to the present northern frontier and to the Pacific Coast; establishing relay stations in various points of the survey and many times camping out on the bare plains. On a certain night of the year 1548 a party of mule freighters camped out on a spot known as San Bernabe, and in building a fire to warm themselves, discovered the vein afterwards included in the district of La Luz, which became famous gold and silver vein known as the Veta Madre (Mother Lode), which is without doubt the most notable and the richest vein known to the world. In thickness it reaches at times to 40 meters (131,2 feet), and its known length exceeds 13 kilometers (about 8 miles). On this vein are located the mines of Valenciana, Mellado, Rayas, Cata, Xichu, La Esperanza and many others which have produced bonanzas of more or less importance. In 1728 work was commenced on the San Antonio shaft in the Rayas Mine, but it was suspended later and in its place the Santa Rosa shaft was sunk.

We may mention here the following facts in proof of the enormous difficulties of shaft sinking at that time, which to-day have largely disappeared, owing to the use of modern explosives and machinery.

The Rayas Mine was leased in the year 1719 by Don Jose Sardeneta, he taking over the lease from his brother Don Alferez D. Pedro, who then had it,

FIG. 2.—HOOD OF ANCIENT SMELTING FURNACE.

celebrated for its bonanza mines, and which in the short period of six years produced nearly $40,000,000 in silver.

Two years later, in 1550, in a similar manner the freighter Juan de Raya discovered the immensely rich mine of San Juan de Rayas, whose production of ore still continues, it being one of the principal mines of Guanajuato. This mine, according to official data, during 40 continuous years paid in taxes to the Royal treasury more than $17,000,000. During the year 1558 the mine of Mellado was denounced in "Yuriariapundaro." On April 15 of the same year work was begun on the Mellado shaft and the following day on the Rayas shaft.

During this same year, 1558, in the continuation of the work in these two mines there was discovered the without making much profit from it. Don Jose, who was a very capable and enterprising man, understood that it was better to enter into other arrangements with the owners of the mine rather than to pay rent. These owners were then various members of the family of Franco Toledo, scattered in different places and with whom he arranged a lease on the property by which he became owner of one-half of the mine, obligating himself to sink a general shaft which was necessary for the ready and economical exploration of the property. This shaft already had a depth of 50 varas (137.5 ft.), but this work proved so costly that in spite of his contracts he suspended work and began negotiating with the owners for the purchase of the entire property, which he finally succeeded in obtaining for $200,000. From that moment Don Jose became the sole owner of the mine. He finished the shaft and a short time afterward discovered a bonanza that made him the richest man of Guanajuato.

The mines of Rayas and Mellado are contiguous and in order to facilitate the working of these properties and to avoid the continual differences arising from contrary interests, these mines were united in one company called La Concordia, which will without doubt become a very productive company if the proper elements for working the properties are put in action. At present there are many enterprises tending to take from the Veta Madre the immense riches that it should still contain. It is calculated that neither the 350 years since work begun on the Rayas nor the 140 years since the Valenciana was opened, have been sufficient to exhaust this enormous vein. It is true that the great depth of these mines makes their exploitation difficult and costly, but with modern advantages it is quite probable that we will see repeated the brilliant situation attained by the city of Guanajuato when these mines inundated the world with the silver produced by them.

NOTE ON HYDRAULIC MINING IN LOW-GRADE GRAVEL*

By William H. Radford.

Having worked some rather low-grade gravel during the past season at a small profit, I give the actual figures, in the hope that other mining engineers interested in this line of work may be thereby induced to do the same, in order that we may all get more data on this little-ventilated subject.

The property here referred to is situated in one of the northern counties of California, where hydraulic mining is still permitted by the courts. The water-right belonging to the mine is a good one, furnishing water during about 9 months, whenever there is an average rain-fall, and a fair proportion of the precipitation is in the form of snow. The ditch, about 11 miles in length, is cared for during the rainy months by two men, and during the rest of the year by one; and the water cost last season, delivered at the mine, 0.69 cent per miners' inch. The season commenced in November, 1899, and ended the last of July, 1900. During this time, 655,657 miners' inches (an inch equals 1,728 cubic feet in 24 hours) of water were used for piping, and for sweeping the bed-rock at the end of the season. From actual surveys, this amount of water washed down 1,251,399 cubic yards of material, consisting of pay-gravel lying on the bed-rock, and varying in thickness from a few inches to 8 feet, and practically barren top-material, consisting of mountain slide, carrying considerable broken rock, clay, and soil. The banks varied in height from 50 to 130 feet, the average height being 63 feet. The grade of the sluices was 7 inches to 12 feet, the boxes being paved with block-riffles 12 inches deep. Long bed-rock cuts extended from the heads of the sluices to within a few feet of the banks, and were kept practically to grade as the work advanced. At first, electric drills were used on this work; but as it was found that heavy blasting shattered the rock too much, and caused slips, these drills were abandoned, and hand-drilling was substituted. The bed-rock cuts, run in black slate of poor quality, had to be constantly watched, and in places timbered, to prevent accidents. Electric lights were used in the mine during the night-time, and in the tunnel while cleaning-up was going on. Seven clean-ups were made in the sluices during the season, and at the end of the run the bed-rock which had been uncovered was well swept and everything piped down into the bed-rock cuts; these were run down and carefully cleaned and creviced up. The result of the season's work was $31,618, showing a value of only 2.52 cents per cubic yard for the material washed. The bullion obtained came from the following sources: Sluices, $27,315, or 86.5 per cent of the total; bed-rock

*Paper read before the American Institute of Mining Engineers, Mexican meeting.

ditches, $3,811, or 12 per cent; undercurrents, (2), $492, or 1.5 per cent. The undercurrents were run only 3½ months.

The cost of operation for the season was $27,511, which deducted from the $31,618 of bullion produced, left a profit of $4,107. The total cost was made up as follows:

	Cost.	Cost per cu. yd.
Care of ditch, reservoir, and siphon:		
Labor $2,671		
Supplies 116		
	$2,787	$0.00223
Washing (piping)	2,401	0.00192
Drilling in bed-rock cuts:		
Hand-drilling $1,051		
Electric 269		
	1,320	0.00105
Timbering bed-rock cuts.....	157	0.00012
Electric lighting.....	599	0.00047
Sluice-Building and repairing:		
Labor $1,046		
Supplies 35		
	1,081	0.00086
Blacksmithing	644	0.00051
Cleaning-up	969	0.00077
Moving pipes and "giants".....	899	0.00071
Breaking rocks and clay.....	6,125	0.00490
Clearing ground for piping (cutting brush)	158	0.00012
General expenses, watching sluices, and odd jobs	3,089	0.00250
Supplies used in mine.....	3,015	0.00241
Taxes, office expenses, legal expenses, surveying, salaries.....	4,267	0.00341
	$27,511	$0.02198

A résumé of the season's work is as follows: Period, 9 months; water used, 655,657 miners' inches; material washed, 1,251,399 cubic yards; cubic yards per miners' inch, 1.91; area of bed-rock uncovered, 7.314 acres; bullion produced, $31,619; average yield per inch of water, 4.82 cents; average yield per cubic yard of gravel, 2.52 cents; average yield per square foot of bed-rock, 9.8 cents; yield per acre, $4,323; average height of bank washed, 63 feet.

The washing of such poor gravel during the past season was due to the fact that the company was finishing up work on one of the benches before moving to another place, and, in doing this, had to wash a large proportion of "rim-gravel," that is, gravel not in the channel, and usually of low grade. Though the profit obtained was small and the final result could hardly be considered a very satisfactory one, still it shows that under fairly favorable conditions, gravel of quite low grade can be worked at a profit.

VIEWS OF AN OLD SMELTER IN MORELOS, MEXICO*

By C. W. Pritchett.

Several years ago, during a trip from Jojutla to Huauatla, in the State of Morelos, Mexico, I was told by my guide of the ruins of an old smelter near by, and my curiosity was excited to such an extent that I went out of my way several miles to see them. I found them very interesting; and, as I fortunately had a few plates and a camera with me, I was able to obtain a few views which may be interesting to others, as showing what was being done in the sixteenth century in the way of smelting in Old Mexico. The date on the old church near by is 1540, and it is believed that the smelters were erected about the same time by the Jesuit fathers. The church is still in use.

The smelter is about 10 miles east of the town of Jojutla, on the Ixtoluca River. There is an old stone bridge over this river, on the road leading to the smelter. The bridge is just wide enough for one animal, and has, at the first pier on the west side of the river, a short turn, which can be discerned in the picture. The plant was an extensive one, even according to the notions of to-day. In what seems to have been the smelting department are still standing the stone and mortar housings of three large over-shot water-wheels about 15 feet in diameter. Water was brought from the river by a splendidly constructed ditch about 3 miles in length. At the river, portions of an excellent dam are still standing. Arrangements were made for the water to flow in small canals along the tops of the division-walls of the building; and, in many places in the building, a connection was made through the legs of the arches with the upper canals, so that, apparently, by pulling out a wooden stopper, water could be had in various parts of the hacienda.

Fig. 1 is a view from a stone staircase in the smelting department which communicated with the upper floor. The view looks toward the entrance, and shows an old sundial on the leg of the third arch in the perspective. Fig. 2 shows the hood of the smelting-furnace. I was unable to get any views of the furnace under the hood. The notable absence of slag, and the arrangement of water-canals at the base of the furnace, suggest that slag granulation may have been practiced here. There were three reverberatory roasting-furnaces, with separate chimneys, arched backs and sloping hearths. For grate-bars, slabs of igneous rock were used, slanting toward the door. Fig. 3 is a nearer view of one of these furnaces.

FIG. 3.—REVERBERATORY ROASTING FURNACE.

Fig. 4 is a view of what was to me the most interesting feature of this hacienda, a stone stamp-mill, probably the oldest in existence on the continent. It seems that this battery may have consisted originally of four stamps, but that part of it was walled up and only two stamps were used. The mortars were of stone and could be removed when worn out. The stems were evidently of wood, and 4 to 5 inches square, as indicated by the square holes in the arch above each mortar. The stamps were evidently raised by hand and allowed to drop. Back of the mortars is a small room, evidently for ore and the feeder. The roof above is reached by stone steps, and, judging by the worn places around the guide-holes, the men who raised the stamps probably stood up there. In front of the mortars, for a distance of about 30 feet, are still portions of an inclined plane of stone, with riffles cut in it, which was probably used for concentration. It seems probable that this plant was built to treat the ores from the mining camp of Huauatla, about 20 miles distant.

*Abstract of paper read before the American Institute of Mining Engineers, Mexican Meeting, 1901.

ALUMINUM-ZINC ALLOYS

By Dr. Joseph W. Richards.

Many contradictory statements have appeared regarding the properties of aluminum-zinc alloys; and since these statements were all apparently made in good faith, the divergent accounts are probably to be ascribed to the use of impure aluminum or impure zinc, or to a lack of the knowledge of how to properly alloy the pure metals. In fact, the experience gained in the practice of alloying enables one to continually obtain better and better results, such as are wholly unattainable to the unskilled metallurgist.

Tissier Brothers, in the first book written about aluminum, describe the alloys of 1 part of aluminum with 2, 3 and 10 parts zinc. They found these to be brittle, looking like zinc, fine-grained, and more fusible than aluminum, but less so than zinc. These alloys were used at first in attempts to solder aluminum, but they would not run liquid, and made poor looking joints. Aside from this, the alloys had no mechanically useful properties.

My own experience confirms these statements. Out of 8 alloys, which I have made, containing 2, 3, 4, 5, 6, 7, 8 and 9 parts of zinc to 1 part of aluminum, with specific gravities from 4½ to 6, there appears to be none with any specially valuable mechanical properties. Even the alloy of 1

part aluminum to 1 part of zinc, with a specific gravity of 4, may be classed with the above alloys.

Alloys containing more aluminum than zinc first commence to possess valuable properties. The alloy of 2 aluminum to 1 of zinc, containing 33 1-3 per cent of zinc, is a remarkable alloy. W. F. Durand has described it (*Science*, 1897, page 396) as being "equal to cast-iron in strength, melts about 800° F. (425° C.), does not readily oxidize, takes a fine finish, perfectly fills the joints of the mould; and is, like cast-iron, brittle, but resists corrosion well." After several years' experience with this alloy, commencing in 1895, I can substantiate the general correctness of Durand's statements, and add to them the following observations:

Experience in making this alloy has led to considerable improvement in the results obtained. The first samples made were just about equal to cast-iron in strength, tests showing 18,000 to 24,000 pounds breaking strain per square inch, with no preceptible elongation; but at present there is no difficulty in reaching a tensile strength of 40,000 pounds, in castings. It resembles closely in its characteristics a high-carbon steel, being extremely rigid, slightly elastic, and breaking short with a fine-grained fracture. It works well under the tools, in turning or boring, not requiring lubrication. It is the hardest and strongest of the available alloys of aluminum and zinc, takes a high polish and keeps its color very well. It is not so resistant to shock as the other alloys containing less zinc. Its specific gravity is 3.8, and calculation shows the remarkable contraction of 17 per cent taking place during the alloying of its ingredients, which suggests the cause of its great strength. Numerous uses for this strong, rigid alloy will suggest themselves to every mechanical engineer.

The alloy of 3 parts aluminum to 1 part zinc, containing 25 per cent of zinc, is the most generally useful of all the aluminum-zinc alloys. It is softer than the previous alloy, has a tensile strength of 35,000 pounds per square inch, and elastic limit nearly the same, with a slight elongation before breaking. It is, therefore, not a malleable alloy, but yet it is not brittle, for it bends slightly before breaking. This quality is a valuable one, for it enables one to straighten out a casting to a certain extent, under the hammer. Remarkably clean and sharp castings can be made with it, when experience has been attained with the proper gating of the mould and the exact temperature of casting. As with all these alloys, overheating in the crucible must be scrupulously avoided, as well as the use of iron stirring implements, since oxide or dross do not separate out of the metals easily, and may thus get poured into the mould and injure the casting. Its specific gravity is 3.4 and the contraction taking place during alloying is, therefore, 14 per cent, which indicates a close and intimate combination.

This alloy, when properly made from the pure metals, is all that could be desired in its working qualities, being equal to the finest brass in the lathe, under the drill, and in not clogging the file. It casts sound, takes a high polish, and has as fine a color as the best aluminum. It is not so hard and short as the 33 per cent zinc alloy, nor quite so strong, but has supplanted it for most purposes because of its better working qualities and greater reliability under shock. It is at present in use for scale beams, surveying and astronomical instruments, light machine parts, gear wheels cut from blanks, cash registers, calculating machines, testing machines, indicator drums, surgical appliances, cases and parts of pneumatic tools, etc. It is non-magnetic, and, therefore, particularly useful in scientific instruments. The use of this alloy is increasing rapidly, and it bids fair to be the most generally useful of the light aluminum-zinc alloys.

Below 25 per cent of zinc the strength and hardness of the alloys decrease rapidly, and when the zinc is 15 per cent or less, the alloy can be forged, rolled or drawn. The alloy with 15 per cent of zinc has in castings an elastic limit 16,000 lbs. per square inch, tensile strength 22,330 lbs., elongation in 2 inches 6 per cent, and reduction of area 16½ per cent. It can be rolled, and drawn into wire, if frequently annealed. Mechanical tests of this alloy after working have not yet been made. The alloys with less than 15 per cent of zinc become softer and weaker, roll and draw well, but require lubrication of the tools during working. They may find application for special purpose where the previously mentioned alloys are too hard.

FIG. 4.—OLD STONE STAMP MILL.

THE VALUE OF ORES IN MEXICO.*

By N. H. Emmons, 2d.

In the United States the value of gold and silver ores is everywhere reckoned in ounces troy of the metal per "short ton" (2,000 lbs. avoird.) of the ore. In the case of silver, which fluctuates in market value, the New York quotation on a given day must be known in order to determine the gross value of an ore at that date. In Mexico the assay is reported in kilograms of silver or grammes of gold per metric ton. As everyone is aware, this is practically a percentage system, 1 kilogram of silver per metric ton (1,000 kilograms) being 0.1 per cent, and 1 gramme of gold per metric ton, 0.0001 per cent. The notation is simple and convenient for both assayer and miner.

The Mexican buyer purchases at an unvarying price for silver, payable in silver and at a fixed price for gold, payable in gold if the seller insists, but preferably in silver at the ruling rate of exchange between United States gold coin and Mexican silver coin. The price of silver is $40.915 per kilogram in Mexican silver dollars. That of gold is $675.416 per kilogram in gold coin. The mints do not, as a rule, issue gold dollars, as the Government keeps them to pay the interest on the national debt. Almost all bullion containing a considerable percentage of gold is shipped to foreign countries (principally the United States) to be refined.

The Mexican Mint receives for refining and coining no bullion which does not at least fine 0.900 in gold and silver. For the fine silver, it pays $40.915 Mexican per kilogram, less 2 per cent coinage-charge and 3 per cent stamp-tax. For assaying each bar, not more than 31 kilograms in weight, $2.50 Mexican is charged, and for separating gold from silver, $0.75 per kilogram of bullion. Gold (if over 3-1000ths is present) is paid for at $675.416 gold per kilogram; but payment is made in silver dollars at about 10 points below the current quotation of exchange. Finally, the State tax about to be mentioned is collected upon bullion, unless it has been previously paid on the ore.

Government charges practically unknown in the United States are the taxes on ores of silver or gold, paid both to the Federal and to the State governments throughout the Republic of Mexico. These taxes (being laid upon gross product, without reference to profit) are likely to be so severe that in many parts of the Republic it has been the custom not to insist upon the payment of the full State tax. The Federal tax, however, known as the mintage tax, is collected upon all the gold and silver produced in the country—either at the mints upon the bullion presented for coinage, or at the

* Paper read before the American Institute of Mining Engineers, Mexican meeting

points of export upon ores or bullion shipped to other countries.

The State "extraction-tax" is levied on ores mined, and supposed to be collected before they leave the mine-yard or patio. This has been found for many evident reasons, impracticable; and it has come to be the custom to collect the tax as the ores leave the mining camp, or, if they are treated in the camp, then as the product is shipped away. The government may accept the sampling and assays of the owners; or an official may be sent to superintend the sampling, and take a special sample for government assay. The manifest of the shipper states the number of metric tons shipped, and of kilogrammes of silver per ton. The collector calculates the silver-value of the shipment $40.915 per kilogram of silver, and collects 2 per cent of that value for the State, and also, according to the Federal statute, 30 per cent of the State tax, or 0.6 per cent of the value, as the Federal tax. The total (2.6 per cent on $40.915) is a direct tax on the silver in the ore of $1.0638 per kilogram, or (1 kilogram being 32.15 ounce troy) about 3.3 cents per ounce.

If the ore is smelted in Mexico, the smelter pays the tax; if it is exported, it must be accompanied with a consular invoice, and sampled and assayed at the border for the Mexican government. In this case the mintage-tax (that is, the charge which would have been made if the bullion had been sent to the Mexican Mint) is also collected. For bullion, matte or other metallurgical product, this tax of 5 per cent is collected upon the full assay value of the metal contained. For ores it is collected upon 90 per cent (and is therefore 4.5 per cent) of the assay-value.

Finally, if ore is sold to any purchaser in Mexico, there must be a bill of sale, or factura, on which are revenue-stamps to the amount of 3 cents for every $5 or fraction thereof. This stamp-tax is not peculiar to sales of ore. It is required for every sale of merchandise amounting in value to $20 or more. The value here contemplated, however, is not the gross value, calculated as above described, but the net value, or amount paid by the purchaser.

It will be seen that the taxes on ores of gold or silver mined in Mexico comprise 2.6 per cent of gross value as State and Federal extraction-tax, plus 4.5 per cent as mintage-tax, or, in all, 7.1 per cent on the gross assay-value, to which must be added the stamp-tax on the factura of 0.6 per cent on the net value.

To elucidate the bearings of this curiously-balanced and complicated set of constant and variable factors upon the Mexican mining industry, let us take as an example a reduction-works, located at the mine, and so situated with regard to ores, fluxes, etc., as to be able to produce bullion high enough in silver to be sold directly to the Mexican Mint. In other words, the standard value of $40.915 per kilogram will be received for the silver, and the charge for treatment will be $15 per Mexican metric ton. Omitting, for simplicity gold and lead and considering the ore to carry silver only, the miner will receive per metric ton, on ore concentrating 1,000 grams of silver, $40.915 — $15 = $26.91 Mexican, less the taxes and duties above set forth. This return is independent of the price of silver. If silver drops to 40 cents, he will still receive $25.91, Mexican, less the same taxes and duties as before—only the exchange-value of this sum will be smaller, by reason of the higher rate caused by the fall in silver. But this smaller exchange-value does not affect his expenses for labor and power, because wages, fuel and domestic supplies are paid for in Mexican money, without regard to temporary fluctuations in the market-price of silver. It is only in the purchase of imported supplies for mining and milling, or machinery, etc., needed for repairs or new constructions, that the difference is felt. Of course, any dividends that might be paid, though they would be no smaller in Mexican money, would be reduced in value to foreign owners by the higher rate of exchange.

Lead has very little value for the Mexican miner, since the price paid for it by smelters is practically nothing, compared to what is paid in the United States. Copper and gold ores pay more profit to the Mexican miner (whether calculated in United States or in Mexican money) the lower the price of silver and the higher the rate of exchange.

Profits (estimated in Mexican money) from silver ores, if they can be treated locally, at expense chiefly payable in Mexican money, are affected only by the amount of imported supplies required for their treatment. If they go to smelters which make their charges in United States money, the returns will depend on the price of silver and the rate of exchange.

As a general conclusion, it may be said that, by reason of the peculiar conditions explained and discussed above, the mines of Mexico are less dependent upon the market-price of silver than those of the United States.

MEXICAN RAILROADS AND THE MINING INDUSTRY.

An interesting pamphlet, prepared specially for the Mexican Meeting of the American Institute of Mining Engineers by Señor Luis Salazar, at the instance of the Secretary of Fomento, gives a condensed account of the different railroads of Mexico, concluding with the following statement:

The railroads have served to reduce freight charges, diminishing prices of the staples of greatest importance and consumption. They have facilitated the exportation of ores to foreign countries and to the new smelting works that have been constructed in Mexico. Facility and economy in transportation have permitted the importation of modern machinery which, on account of its weight and bulk only railroads would have been able to carry to the mining centers to be installed in mines and metallurgical works. The improvements introduced in the Mining Industry are due, in part to the construction of the railroads. To-day ores are sent to foreign countries so that the richest of them may be treated with all perfection, and the miner profits by the premium of exchange on the value of his metals.

A few years ago no one imagined that the products of the mining centers of Guerrero, Hidalgo, Michoacan, Guanajuato and other States, which have hardly an average silver and gold content, and even the really poor ores and the very dump piles, could be worked, obtaining almost the total amount of the precious metals which they contain, paying the cost of transportation to Aguas Calientes, San Luis Potosi, Monterey, or Chihuahua where are now established important metallurgical works, whose creation we owe to the facilities of transportation which can be obtained by the net work of railroads already constructed.

Such mining concerns as were in the country were seriously distressed by the scarcity of fuel which was more and more notable as time advanced. Mining concerns such as those of Pachuca and Real del Monte went so far as to buy timber lands partially deforested to replant them and submit them to a rational exploitation, under the premonition of an industrial crisis for want of wood. The railroads came in time to save them from this dangerous situation, allowing the importation of coal from foreign countries and the working and transportation of coal which is produced in the northern frontier States of Mexico.

The reduction in the prices of articles of the greatest consumption in mines and metallurgical works, such as timber, firewood, forage, machinery, explosives, salt, tallow, iron, etc., is due to the reduction in freight charges. The facilities for traffic and the reduction in freight charges have permitted reductions in the cost of exploitation of mines and in the cost of treatment of ores, the working of mines of low grade ore which were before unprofitable and the consequent increase of workings and of products.

By the railroads not only have the gold and silver mines improved in their exploitation but they have also helped to make possible and profitable the working of coal mines in Coahuila, of iron mines in Durango and Jalisco, of lead mines in Sierra Mojada, and of copper mines in Aguas Calientes and Michoacan.

Some specific data will give an idea of the benefits which have been made in favor of mining by the creation of the railroad system.

The use of coal was before impossible; to-day it is obtained at the price of from $18 to $25 per ton, if we deduct the waste. Salt cost 32 years ago $0.98 per arroba and its present price is $0.38 an arroba; the saving is 61.21 per cent. Imported iron is obtained now at 50 per cent of the price at which it was quoted at 32 years ago. The cost of treatment, without quicksilver, of a ton of ore in barrels 32 years ago, was $12.21; in 1900 the cost was only $10.23, an economy of 16.21 per cent. The cost of treatment by the patio process without including quicksilver, in the Loreto Hacienda, 32 years ago was $16.57; in 1900 the cost was $11.59, a saving of 30.91 per cent. The freight charge from Pachuca to Mexico City, by wagons, was $20 per ton. At present the second class freight rate is $5.50 per ton on the railroad. The freight rates from Vera Cruz to Pachuca on wagons was very variable but the average rate per ton may be estimated at $120; at present the rate is less than $30 per ton by rail and for coal only $12. And if these notable economies have been realized in a mining town which, from its geographical situation and natural resources had the best facilities for working and exploitation, it may be imagined what advantages have resulted in favor of other concerns in other mining districts which had no wagon roads to communicate with the large cities.

The mineral product of the Mexican Republic before the building of the railroads, at the completion of the Mexican Central Railroad and at the end of the fiscal year, was as follows:

1872-1873.....	$976,000 gold	$21,441,000 silver
1882-1883.....	$956,000 gold	$29,569,000 silver
1900-1901.....	$8,848,005 gold	$72,368,795 silver

To the production during the fiscal year just terminated should be added the value of the lead and copper, estimated at $15,134,181. Besides this there is a difference favorable for another increase which is the rise in the value of gold during the several dates that have been mentioned.

To-day the railroads have assumed great importance and have become one of the greatest levers of industry and commerce. The mining industry, more than any other, needs, to sustain its activity, the railroads which transport machinery, coal and quicksilver, brought from foreign parts, which bring the salt from the coast, timber and firewood from distant forests, forage, cereals and other articles of consumption from the agricultural and commercial centers. For the exportation of its products, and for the treatment of its ores, mining must use the cheapest and easiest means of communication.

Mexico, at the present time, is not a country whose agriculture and whose industries leave a surplus that can be sent to foreign countries in exchange for their products. It is principally the mining industry which pays for our purchases which come from outside, whether it be with the products of the mines, in the shape of ores or with silver bullion from the same source. The future expansion of the railroad system of Mexico is then indicated to be in a direction towards the regions of mining production and towards the ports of exportation.

A single glance at the mining and railroad map will enable any one to comprehend the lines of penetration which are under construction to be

connected with the lines already established, especially the Rio Grande, Sierra Madre & Pacific; the Chihuahua & Pacific; the Michoacan & Pacific; the Mexico, Cuernavaca & Pacific; the prolongation line from Jimenez to Parral, the continuation line from Guadalajara to Manzanillo, the line from Durango to Mazatlan, etc., all of which are so favorable to mining that they will not only enable this industry to pay for importations but also will leave a surplus in the country to establish other industries and to be invested in internal improvements which will convert the Mexican Republic into a rich and flourishing country.

THE ZINC AND LEAD DEPOSITS OF NORTH ARKANSAS.*

By John C. Branner.

No precise geographic limits can be given for the zinc and lead region of North Arkansas. In general terms it lies north of the Boston Mountain and west of the St. Louis, Iron Mountain & Southern Railway; but the prospecting and the development of the ore-deposits have not gone far enough to outline more than vaguely the areas over which workable deposits are to be expected. The tardiness of the development of the region is due in part to its topography, as a hilly and partly mountainous country, through which there have been no railways until recently. There is no longer any doubt, however, about the existence in that region of large bodies of zinc ores.

The general geology of the region is, in the main, quite simple, but that of the ore deposits is less so. The zinc regions of North Arkansas lie about the southern flanks of the Ozark dome. The rocks are approximately horizontal, but have a gentle southward dip away from the axis of this dome. South of the zinc region, the sandstones and shales of the lower coal measures form the north facing escarpment of the Boston Mountains. Beneath the coal measure rocks are the limestones and cherts of the lower Carboniferous; and these rest upon Silurian and Ordovician beds.

The uppermost beds (coal measures) have been cut into by erosion along the mountain slopes so that their edges or outcrops have a meandering or dendritic form. The same thing happens with the lower Carboniferous beds; but these, having been more or less protected by the overlaying coal measures, have broader bases, and cover a much larger area. In places, the beds of the coal measures have been removed until the lower Carboniferous rocks, as a thin covering to the Silurian beds, extend many miles north of the margin of the overlying strata.

Inasmuch as all the beds are nearly horizontal, the meandering streams have cut their way down through them all, and we not infrequently have the Ordovician rocks exposed in the bottoms of the valleys, the lower Carboniferous upon the slopes, and the coal measures capping the hills. Throughout much of the region, however, the coal measures have been completely removed, and we have now only the lower Carboniferous cherts and limestones in the hilltops, and the Ordovician beds in and along the valleys. Over a large part of the region all the Carboniferous rocks have been removed, and there remain only the Ordovician beds.

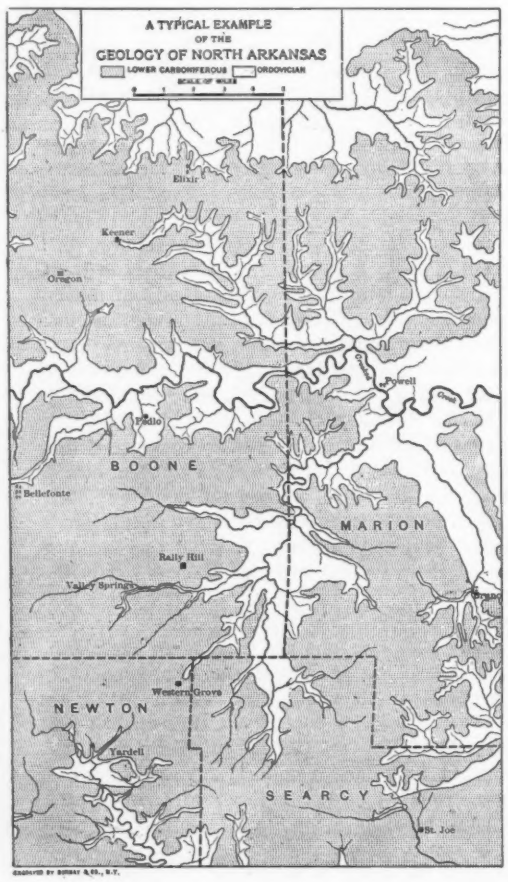
In addition to these general features of the region, the rocks are more or less folded and faulted; and inasmuch as the ores have been affected by the folds and faults, these features of the geology are of especial importance, and are entitled to much more attention than they have received from mining companies.

The ores seem to occur only in the Ordovician and lower Carboniferous rocks, but I know of no reason why they should not occur in the coal measures also, except that these latter rocks have been removed from most of the region, and that, according to the theory of the origin of the ores, a greater difference of level or a greater depression of the beds of the coal measures would be required to bring the ores into these higher rocks.

* Abstract of paper read before the American Institute of Mining Engineers, Mexican meeting.

The ores may be genetically classed as (1) bedded deposits, mostly contemporaneous with the rocks in which they occur; (2) vein deposits, of later age than the enclosing rocks, and occurring (*a*) along faults of fractures, or (*b*) filling brecciated beds, formed along underground water courses; and (3) alteration products, chiefly carbonate and silicate ores, derived by alteration from the sulphide ores of the first and second divisions.

1. *The Bedded Deposits.*—Some of the zinc ores occur disseminated through beds of chert or dolomite. In these cases the ore is confined strictly to certain beds, while the strata above and below contain, or may contain, no zinc, at least so far as can be seen with the naked eye—small gash veins, which occasionally cross both the ore-bearing and the barren beds, being excepted. The zinc is usually pretty evenly disseminated through these ore-bearing beds, but it often happens that the beds are richer in one place and poorer in another; and sometimes the ore, instead of being disseminated, occurs in streaks or gashes through the ore-bearing bed. One of the most interesting things in connection with the bedded deposits is that, in several instances, the beds are found to be richer in the troughs of the synclines than elsewhere. Instances might be given to show that the ore beds may be sometimes traced for miles



MAP OF NORTH ARKANSAS.

along an outcrop, richer here and poorer there, but always the same bed. These bedded deposits are regarded in the main as the originals from which all the other zinc deposits of North Arkansas have been, either directly or indirectly, derived.

2. *Vein Deposits.*—By vein deposits are here meant ore bodies which have accumulated in fractures, however made, and are of later age than the beds in which they occur. These fracture deposits belong to two large classes: First, those formed in faults and allied fractures; second, those formed along old subterranean waterways other than faults.

a. Fault Deposits.—The faults in the zinc region of North Arkansas have broken across the whole series of rocks there represented, from the Ordovician to and including the lower Carboniferous. I have no doubt that these faults pass up into the rocks of the coal measures also; but I have not had occasion to trace any of them from the zinc region into and across the area of coal measures. Some of them are normal, others are reversed, and still others show no vertical, but only a lateral displacement; several of them seem to be double reversed faults. In some instances they can be traced for many miles, in others they are purely local. In some cases the fractured zone along a fault is several hundred feet wide; in others, the walls are closely pressed together. Occasionally a fault is marked by a edge of siliceous breccia; in other instances there is no topographic evidence of the fault.

At several places the fractured zones contain either zinc or lead ores, or both, and at one place the fault contains copper ore. The breccias along the lines of fracture are frequently cemented with dolomite spar and sphalerite.

In many instances, perhaps in all of them, where there is ore in the breccia of a fault, there is a little ore in the walls of the faulted zone, but as a rule this ore does not penetrate far into them.

b. Waterway Deposits.—The second class of ore bodies newer than the surrounding rocks, is that formed along ancient underground waterways other than faults. These deposits are quite irregular in form and direction, and may be either large or small, rich or poor. It sometimes happens that these old waterways have followed certain structural features, such as synclinal folds, guided apparently by the impervious character of adjacent beds and by the porous or open nature of the conducting beds. In other cases they have cut across the strata, changing their directions frequently, and abruptly going up, down or sidewise without any apparent cause. These waterways appear in some instances to have been more or less open caves.

It is to be expected that the ore bodies along faults and those formed along other waterways should occasionally merge into each other. Such a deposit is exposed at the Lost Mine in Baxter County.

The bedded deposits are, as a rule, easily distinguished from the vein deposits, not only in the beds themselves, but often in large hand specimens; but deposits formed along the faults are not to be distinguished from those formed along the old waterways, except where something can be seen of the form and structural relations of the ore bodies themselves.

3. *Alteration Products.*—The alteration products of the region offer nothing new or unusual. They consist chiefly of smithsonite and calamine, but the so-called "tallow clay," described below, is worthy of mention in this connection. Where lead ores prevail, there is usually more more or less anglesite, cerussite and pyromorphite.

It has already been pointed out that the ore bodies of Arkansas are partly contemporaneous with, and partly newer than, the rocks with which they are associated. The bedded ore deposits were laid down in horizontal sheets along with the cherts, quartzites and dolomites, through which they are now disseminated. Whatever changes have affected these rocks have affected the ores which are a part of them. Where the beds are bent, the ore bodies are bent; where the rock beds are faulted, the ore bodies are similarly faulted; and where streams have cut down, through the rocks, valleys of various depths and widths, these valleys have been cut through the ore beds likewise. The miners and prospectors of North Arkansas often have a fear of blasting into the face of one of these bedded zinc deposits, lest it "go blind," or pinch out, a little further in. The bedded ores of North Arkansas do vary more or less in the thickness of the ore-bearing portion of the bed and in the percentage of sphalerite in a given amount of gangue. But the bedded deposits are remarkably even in thickness and richness; and if they change for the worse in a short distance, they may be depended upon to recover their richness within an equally short distance. No sudden changes in the thickness or richness of the bedded ore bodies should excite alarm;

it is only the gradual thinning out or impoverishment of the beds that should cause uneasiness. Of course, a fault may, and often does, bring the ore beds up against a barren wall; but beyond the fault the bed can usually be relocated without much difficulty and followed further.

The excellent character of the sphalerite of North Arkansas is worthy of note. Analyses show that out of a large number of analyses of sphalerite, the largest amount of iron (Fe_2O_3) found was 0.67 per cent; the zinc contents ran from 58 to 67 per cent. Analyses of specimens of the smithsonite show it to be of excellent quality. Owing to the large amount of foreign material held mechanically in all large lumps of smithsonite, analyses of car-load lots would necessarily run lower in zinc than do the particular specimens analyzed.

The yellow mineral popularly known in the mines as "turkey fat," is smithsonite, colored with a little cadmium oxide. This kind of smithsonite occurs at several of the mines, but is most abundant, perhaps, at the Morning Star, on Rush Creek.

The early zinc mines of Arkansas were mines of smithsonite, and the ore was found in the surface clays and soils, along and near the outcrops of deposits of zinc blende. Although there is hardly a zinc prospect in North Arkansas which has not yielded some smithsonite, there is but little search nowadays for smithsonite alone. I feel reasonably confident, however, that when the search for the zinc ores of North Arkansas has been properly systematized, large bodies of zinc carbonate will be discovered. These are most likely to be in regions of deep rock decay.

Calamine is much less abundant in Arkansas than either sphalerite or smithsonite. The most abundant deposits now known are in the Sugar Orchard District. The Almy Mine is at present the most remarkable producer of calamine in the State.

What is commonly known in the zinc mines as "tallow clay" or "buck fat," is not a definite mineral, but a mixture, probably of common clay and the mineral calamine. At present this material is not looked upon as an ore of zinc, simply because no satisfactory process of smelting it has been devised. Tallow clay has a peculiar feel, by which it is commonly recognized. It may be either red, yellow or brown in color. It occurs, in pockets and seams in the rocks, in nearly all of the zinc mines of North Arkansas. In some of the mines it is found in great abundance.

The following general conclusions seem to be warranted:

1. The zinc-ores of North Arkansas are remarkably pure.

2. The zinc-ores were originally deposited as disseminated ores in sedimentary beds, mostly of organic origin, in which some of them are still found.

3. The position of the ores in the beds has been changed, more or less, since they were originally deposited.

4. These changes have been going on ever since the original deposition, and are still in progress.

5. By means of such changes, vertical and other fissures have been filled with ores brought into them by circulating waters from above, from below, and from the sides.

6. The position of the ores in the secondary deposits has been determined largely by those structural features that have guided the underground waters in their passage through the rocks.

7. The accumulations of ores have taken place sometimes along syniclinal troughs, sometimes in fissures along fault-lines, and sometimes in the breccias formed along other ancient underground watercourses.

8. In many instances the subterranean waterways have been closed by the deposition of mineral matter, and the water has sought other channels.

9. The carbonates and silicates have been produced, mostly in place, by the alteration of sulphide ores.

THE MINING DISTRICT OF PACHUCA, MEXICO.

By Ing. Ezequiel Ordonez.

The two mining districts of Pachuca and Real del Monte are well known by their antiquity and the extraordinary richness of their veins. Situated at a distance of only 62 miles north of the City of Mexico —the first one is on the western slope, and the second on the eastern slope of the range of mountains bearing the same name, and which bound the great Valley of Mexico, at a distance of only three miles between each other. Close to the celebrated mining region of Pachuca is located the city of the same name, capital of the State of Hidalgo, at 2,460 meters above sea level, with 35,000 inhabitants, the majority of whom work in the mines.

The mining district of Pachuca has been known since the remote days of the Conquest, for all historians fix as the date of its discovery the year 1522, scarcely two years after the conquest of New Spain by Cortes. Some people are under the impression that the mines had already been exploited by the Aztecs before the time mentioned above, though there is no written testimony to prove it, but in all probability it may be that the excavations made by the Indians were mining operations in the beautiful place called Las Navajas, from which obsidian was extracted by the aborigines to manufacture points of their lances, knives and the variety of utensils so much admired by the historians, archeologists and ethnologists.

These excavations, although now almost completely destroyed, can be recognized on the slopes of the mountains not very far from a town called Pachuquilla.

It is impossible now to trace the exact history of the mining development of this district, because of the city files of official documents kept in the convents having been destroyed during the war of independence and some other internal revolutions. It is only known that one of the veins first discovered and exploited was the Xacal, the outcrop of which projected from the slope of the canada of Pachuca precisely in the same place where some open cuts and workings are found. This is considered sufficient evidence of former operation.

After 1557 the mines of Pachuca won their celebrity owing to the impulse given to their exploitation by the fortunate invention of the patio process for the reduction of ores by a miner by the name of Bartolome de Medina. It is stated that this discovery took place where La Purisima Chica mill is situated at present, near the San Juan Mine.

Since the year above referred to, the mines have been worked more successfully, as well as during the seventeenth century, with ups and downs. In 1670 the Royal stores were established, where quicksilver was sold. At this time the Xacal Mine alone yielded $7,000 per day, the Encino Mine 240,000 ounces of silver per annum, while La Trinidad, during ten years and with a force of 1,000 men produced about $40,000,000. In 1700 a terrible fire destroyed all works at the Encino Mine, burying numerous victims. This unfortunate accident coincided with the decadence of the district so noticeable during the eighteenth century, and which then resulted on account of the impossibility of draining the mines to any great depth.

In spite of these obstacles, some of the mines resumed their work at a shallow depth and on a small scale until the war of Independence was initiated, when all work was completely paralyzed, the greater part of these mines having been owned by the Spaniards. In 1812 the insurgents pillaged the Royal stores and stole the documents from the files. This paralysis lasted until 1824, when the Count of Regla and a celebrated English miner, who had organized a company in London, continued the work, not however without serious difficulties and accidents, making heavy expenditures for machinery (for the purpose of draining the mines), the transportation of which at that time was very difficult, buying mines in bad condition and in constructing expensive buildings. Rich ores were the only available ones, the salaries of the technical clerks were high, the dead work large and the administration complicated. The result of this state of affairs was the ruin of the company, which was dissolved in London in 1848 with a deficit of $5,000,000, and a total loss of more than $11,000,000.

In a short time a new company was formed, which resumed work on certain mines, among which was the Rosario (still being worked) and which on the continuation of the famous vein of Xacal, at the conjunction of the two branches immediately proved abundant and rich ores. In the San Nicolas shaft on the same vein, and in the region of the bonanza, they installed in 1853 a balancing pump which permitted the work to reach a depth of 200 meters continuing along the bananza. Immediately afterwards work on the Xacal Mine was continued, giving excellent results in 1863. After this time, the number of mines producing on different veins augmented progressively and this district in 1895 became one of the most important ones in the New World for its enormous production.

About the year 1879 the Santa Gertrudis bonanza was discovered, producing unusual excitement in mining circles in that locality and a rapid increase of population, which was accentuated by work on a new bonanza at San Rafael Mine, actively pushed since 1883. These mines in less than 25 years yielded about 2,000,000 tons of ore.

The exploitation of these immense bonanzas, it may be said, resulted in the completion of the construction of the Hidalgo Railway, which gave Pachuca direct comunication with the Capital of the Republic. A little later on, two new lines were opened to the public, a branch of the Vera Cruz Railway and also the Mexican Central, assuring direct communication with the Gulf of Mexico and the United States. The flourishing condition of Pachuca was abruptly interrupted by a disastrous inundation, which took place at the close of 1895 in the Canones of the Vizcaina vein, soon invading the works of the other mines. The fatal results of this have exercised such a powerful influence on the mining affairs of the district that since that date the decadence of Pachuca has been manifested by the diminution of the Government income and taxes, dullness in commercial affairs and decreased activity in the mills.

The principal mining companies at present established in Pachuca are the Real del Monte & Pachuca Mining Company, the largest one on account of the number of mines which it has in operation and its important management; the Santa Gertrudis, Maravillas and San Rafael mining companies.

Pachuca occupies the first place in mining districts of Mexico on account of its variety and amount of machinery, number of draining plants, different milling plants and its electric power recently inaugurated. It is also remarkable for its numerous shafts, extensions and methods of working.

Its drifts, excavations and cuts represent not less than 300 kilometers in length. According to a rough calculation recently made, Pachuca has produced since its first discovery more than 3,500,000 kilos of silver.

The range of mountains of Pachuca, on the slopes of which lies the city of that name, forms the northeastern boundary of the Valley of Mexico, and is considered as a branch of the eastern chain of the Sierra Madre Mountains. The crest of the mountains extends in an approximate direction to the northwest 45°. The attention of the traveler has always been attracted, not only by the extraordinary richness and abundance of the veins, for Pachuca District only contains the smaller part of them, but also on account of the beautiful variegation of the mountains, either covered with exuberant alpine vegetation or naked, cliffy, gigantic and fantastic rocks; also with deep cañons and lovely valleys of delicious climate and even temperature where small towns have been built. The Pachuca range of mountains, whose beauty can be admired from any of its peaks, is one of the most attractive places of the Central Tableland.

The principal trend of the range from the abrupt peaks of the Organos de Actopam, which are seen in

the distance from the railroad, have a longitude of 40 kilometers northwest up to the slopes and prolongations of the Navajas Mountains to the southeast and both extremes join with some other important orographic elements.

On the crest of the range rise peaks and tablelands to a considerable height above sea level; for example: San Cristobal Mountain 2,880 meters, Las Ventanas del Chico 3,086, Cerro del Zumate 3,057 and Las Navajas 3,212. For their remarkable beauty we may mention the magnificent forests which surround these ranges.

In the Pachuca veins it should be noted at once by the nature of the ores of which they are composed and in the vertical sense two zones: the upper one composed of oxides (red) ores, and the lower zone of sulphides (black) ores. The first zone contains, as principal minerals, outside of iron always abundantly auriferous, oxides of manganese (quemazones) chlorides and bromides of silver. The lower zone contains the sulphides of different metals, lead, silver, etc. As will be understood, it generally occurs that in this region and at different points, the upper zone corresponds to the hydrostatic level of the country.

The minerals in this zone have been principally chlorides and bromides of silver, which makes it easy to understand the secret of the ease in treating the ores by the amalgamation or patio process and the active exploitation of the superficial bonanzas. In our day, the exploitations are found exclusively in the lower depths of the veins in the "negros" zone, the only one from which we can procure reliable and complete data in regard to its composition and nature. This will be described in detail.

The veins are in part composed of a compact breccia in the upper part and even in the deep regions, on account of action subsequent to the filling in of the fissures, a fact which is of great influence in the distribution of the richness and in the relative hardness in several parts of the veins and which has not escaped the skillful eye of our miners. The quartz in the veins is of a greasy luster and milky color and sometimes has a blue chalcedony appearance in the streaks of the side walls, where it is sometimes also greenish. Many veins carry the amethyst quartz, either covering geodes or in the shape of streaks of crystals radially grouped, which alternate with streaks of white quartz.

The calcite is only found in small quantities as matrix in the Pachuca veins, and it is not a constant mineral. It appears in crystals upon the quartz geodes or in small veins filling small narrow openings and finally in the last layers of concretions.

As regards the sulphides, it appears that minerals such as pyrite, galena and argentite were in the majority of cases deposited at the same time as the quartz, as their blending is so perfect that it is impossible to separate them. It also appears that the quartz has been deposited alone, the barren quartz alternating with streaks of rich quartz. When closely mixed with sulphide it gives a gray tone or distinctly white, with fine black spots, and when in payable amounts is called by the miners "azogues."

Concretionary streaks alternately with barren quartz and azogues and parallel and symmetrical to the side walls may be seen very readily in the old workings in the San Pedro, Cristo and other mines. On the Vizcaina vein, in the Santa Ana Mine, the black sulphides fill irregular cracks, which cross the quartz, indicating that the sulphides were the last to be deposited. Fragments of the rock displaced from the walls floating in the vein are found at all known depths without any regularity whatever in their distribution and of all dimensions. These fragments, more or less angular, demonstrate that they have not traveled any great distance. The concretions of quartz and of the sulphides are made immediately surrounding each fragment, with the same regularity through the entire thickness of the vein.

Manganese is so abundant in the veins that at times it constitutes the greater part of the matrix. We have already stated that on the surface it is found in the form of earthy or compact oxides mixed with the quartz, or isolated in streaks. Towards the bottom, the oxide decreases little by little, being substituted by rhodonite, a silicate with varied and shaded structures in red, rose and white, compact with fibrous.

The ore extracted from the famous bonanza called Rosario, was characterized by the abundance of silicate of manganese and of the oxides associated with argentiferous sulphides. Other compounds of manganese are found at times in small quantities, some of which are the xonaltite, the bustamite and the rhodocrozite.

From the manner in which the manganese presents itself in the veins, it is supposed that it must have appeared after the first deposition of quartz, as it is seldom found near the side walls, while in the middle of the veins it is very much mixed with the argentiferous ores to which it has served as a vehicle.

When the manganese does not exist in the veins the lower parts contain it in small quantities between the last named products of the concretion covering the cavities in the quartz.

In the Santa Gertrudis vein of the Barron Mine, baryta has occasionally been found in beautiful crystals at 150 meters depth. Gradually, as one descends in the veins, the oxide of iron diminishes little by little and finally consists of simply two narrow streaks adhering to the walls. At the same time the oxides of manganese transform themselves into silicates, from which the oxides of the surface result by the dissolution of the silicates of manganese by the carbonated waters of the surface. The oxides of iron and of manganese are always in similar proportions.

Pyrites are very frequent in the mineralized parts of the veins, very abundant in the mass of rocks in the immediate vicinity of the veins, sometimes found in granulated structural mass and sometimes in fine crystals and isolated grains. The existence of pyrites in the rocks is so regular near the veins that they have more than once served as a guide to indicate the proximity of the veins looked for in the extensive works of investigation. The pyrites in the rocks of the walls in grains and complete crystals do not contain even traces of precious metals; on the contrary, the solid granular pyrites of the veins always contain them mechanically interspersed. In the barren parts of the veins, an increase in the amount of pyrites demonstrates the proximity of richness. The rich pyrites and the sterile pyrites must have different origins.

The pyrite of the altered rocks in fine crystals is the product of a regeneration. The sulphate of iron, which results from the decomposition of the pyrites in the interior, may replace the pyrites in special conditions in the presence of the organic matter near the surface.

The granular pyrite of the veins is always accompanied by other sulphide ores as fine grained, the galena, the argentite and the chalcopyrites forming the principal ores of these veins. There are some times found estephanite and polybasite. The blende seldom exists in the regions so far exploited and it would appear that their presence indicates impoverishment.

At a depth of 350 meters in the San Rafael and Zotol mines there have been found ores with a little blende and threads of native copper, accompanied by argentiferous base minerals; on the contrary in the old workings of the San Pedro Mine the blende found was almost entirely free from precious metals. The native silver is found at all depths; the ruby silver has never been found in the Pachuca veins. This distinguishes the district from other mining regions of the central plateau with which it has been compared and which are similar even from a geological point of view.

The principal problem of a group of important veins is the distribution of the richness in the horizontal sense as well as in the inclination.

Unfortunately the data which we have been successful in obtaining relative to Pachuca are incomplete because the information is lacking in the very extensive plans of the old workings and also on account of the little attention on the part of the engineers in charge of preparing the plans of the mines. Observation and study of the cavities from which there have been extracted great bonanzas, cannot be easily made because they are destroyed or abandoned; neither can it be done in the new workings, as they are filled and fortified to serve as passage ways to the new exploitations. However, a superficial inspection of the horizontal projection of the map of the subterreanean works at Pachuca immediately shows that the bonanza parts of the veins group themselves in a zone oriented from northeast to southeast, tending nearly normal to the parallel system of veins, and that these bonanzas are distributed in an alternate manner; that is that the bonanza of one vein places itself in front of the sterile portion of the neighboring veins and so on. If one observes the vertical projection it will be seen that the bonanzas group themselves into two distinct zones, namely, the upper zone above the mouth of the shaft of San Juan and the lower zone extends to the present works. Some veins (Cristo) have only been bonanzas in the upper parts, others (the Vizcaina, Santa Gertrudis), only in the lower zone, while the Analco and Corteza veins have been bonanzas in both zones.

The contour of a bonanza is generally irregular, although it may have a frequent tendency to acquire an elliptic form. Very seldom have they circular or elliptic outlines, and it would never be advisable to designate them as columns or chimneys, as they have at times been called. If we compare the number of bonanzas of the upper zone with those of the lower, we will find that those of the former are greater; a fact which is contrary to that which was supposed to be the case in Pachuca, where everyone believed that in reality the bonanza region of Pachuca was to be found at a depth of 100 to 150 meters.

The dimensions of the bonanzas vary considerably. Some are of collossal proportions; one of the largest being the San Rafael, which was found at more than 100 meters depth and is of an elliptic form whose greatest axis is of more than 1,000 meters and the smaller 400 meters, with an average thickness of 2 1-2 meters. This bonanza produced nearly $14,000,000 during a period of ten years.

The great bonanza of Rosario produced from 1853 to 1883, 30 years, $28,000,000. From the Encino Mine, there was produced a bonanza of $6,000,000 during the 18th century, at above 200 meters depth. Unfortunately we cannot furnish any data as to the enormous productions of the Santa Gertrudis bonanza, perhaps greater than that of San Rafael.

The miners employ distinct terms to designate the rich parts of the lodes and which, in themselves, give an idea of their relative magnitude. The small bonanzas of more or less regular form are called clavos—"nails." When several are found close to each other they are called bolsas—"pockets."

The small rich isolated parts distributed at hazard in the veins are called ojos—"eyes," and the mineralized points moscas—"flies." It will be understood that these terms do not have an absolutely precise meaning.

In Pachuca, the impoverishment of the veins at great depth is admitted to be a fact, as at the bottom of some of them it has been seen that those composed of sterile galena and blende, although of good appearance are very poor and their value incapable of paying working expenses. We believe that carrying these investigations to a greater depth, there might be found and uncovered new bonanzas after removing an intervening portion more or less impoverished. We base the assertion upon certain works. For example: in the San Rafael and Maravillas mines, beyond an impoverished portion, there has immediately appeared native copper with polibasic mineral, blende, notably rich ores naturally rebellious. These show what would be the mineral composition of the ores of the third zone, which at no distant date, must be uncovered, thus giving life again to the mineral production of this district, which at the present time suffers in consequence of the crisis caused by an inundation which it has not yet been able to overcome.

Before concluding, let us state that mechanical actions and movements in the veins have decided changes in the nature of minerals, of which they are composed, and phenomena of mechanical transporta-

tion, which caused accidental richness in the veins, frequently accompanied by products of trituration, called in the district "lamas," which are at times extraordinarily rich; and finally that the parts of the veins originally rich correspond to the places more cracked and distorted, where the fissures were larger where the veins are less inclined and where they change direction, and at the points where the branches separate, thus accentuating the importance of the bonanzas and locating them.

THE REPUBLIC IRON AND STEEL COMPANY IN ALABAMA.

By Our Special Correspondent.

Officials of the Republic Iron and Steel Company have recently made two trips of inspection to this district. The party made a careful survey of the field of operations covered by them in mining ore and coal, quarrying stone, and in the manufacture of pig iron, bar iron and steel.

This company has in operation in Alabama the following plants: Rolling mills at Gate City and Birmingham, where they make open-hearth steel and roll iron and steel. Coal mines at Dayton and Republic, where large quantities of coal are mined. Iron ore mines of red ore on Red Mountain below Birmingham, and brown ore banks at Goethite and Murphy Bank. Blast furnaces and coke ovens at Thomas, between Birmingham and Ensley.

At the last named place this company has now under construction additional coke ovens and a third blast furnace. This furnace is 85 by 18 1-2 feet, and will be, when completed, the most modern in the South, and the equal of the best Northern furnaces.

The brown ore properties at Goethite and Murphy Bank are considered the best in this section, and large improvements will soon be made in the way of installing steam shovels, and narrow gauge tracks to handle the material in greater quantities and more economically.

The coal mines of this company are also of the best. Having been opened only in the last few years, but little impression has been made on the supply. The most successful coal mine is at Republic, where mining is being done on the Pratt seam of coal at the rate of 2,000 tons daily. This is the most generally mined seam in the State; in 1900 it produced three times as much coal as any other one seam, and over 40 per cent of the total output of the State. It is an excellent steam and coking coal. The seam is about 4 feet thick, and makes a coke running about 3 per cent volatile matter, 87 per cent fixed carbon, 10 per cent ash and 1.5 per cent sulphur.

The mining is mainly drift mining, and all on the room and pillar system. In good practice from 85 to 90 per cent of the coal should be won.

The remaining 10 to 15 per cent is coal left in entry and air course pillars.

This coal property, carrying the Pratt seam, was well selected years ago by Mr. Samuel Thomas, of Pennsylvania, and up until less than three years ago remained untouched. It is located on the main line of the Southern Railway, 11 miles west of Birmingham. This company's other coal property, at Sayreton, is also on the Southern Railway, about four miles from Birmingham; but this mine is connected with the furnace plant at Thomas by a standard guage railroad owned by the Republic Company, over which road coal is carried from the mines to the coke ovens. Both mines are equipped with coal washers of the Stewart type.

THE CONSOLIDATED FRANKLIN MINES.

By H. Foster Bain.

The properties which have recently been acquired by this corporation are located on Seaton Mountain at Idaho Springs, Colorado. They include 17 patented claims and one location and have heretofore belonged to two separate companies; the Franklin and the Silver Age. The new corporation also acquires important water rights on Clear Creek and the Silver Age and Wilkie mills in Idaho Springs. The consolidation of the properties is for the purpose of opening the mines on a larger scale and in a more systematic manner. The mines have a recorded production of $850,000 and there are important ore reserves now blocked out. In addition the mines have an assured future from the fact that the main vein, along which the company holdings extend 3,000 feet, is the Gem Vein which was, in April, 1900, cut at a depth on the dip of 2,200 feet in the Newhouse Tunnel. This vein is now being worked by the owners of the Gem through the Newhouse and shows at that level ore bodies of satisfactory size and value. Their lateral now being driven to the east will, within a few months, cut into the Franklin ground. The new company will then begin mining through this lateral and the Newhouse Tunnel.

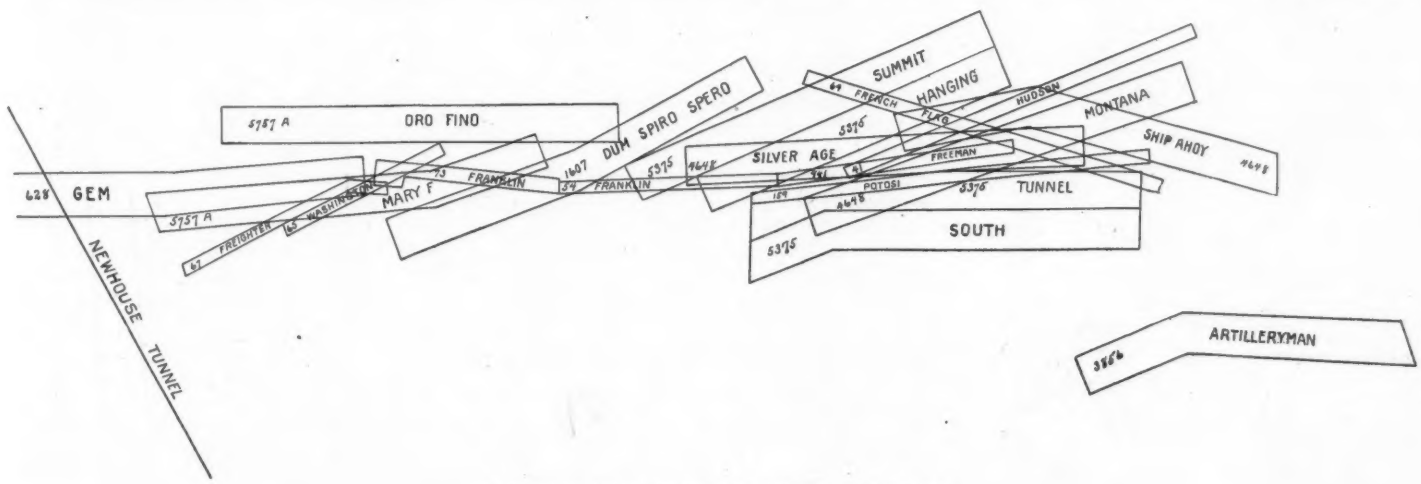
In the meantime work will be pushed in the upper workings. These are opened through an adit now driven nearly the entire 3,000 feet along this vein and attaining a maximum back of 550 feet. While much of the ground above this adit has been worked out, an important amount of it is yet unbroken. In addition two levels have been started below the adit and some ore has been taken out of them. At present the main work is in and above the adit. The first level below it has been driven to the west during the past summer and is expected soon to cut an ore shoot which, at the adit level, yielded ore of very good grade. This lower level is reached by means of a shaft 1,000 feet in from the mouth of the adit.

All the work in the mines is done by means of compressed air which is used for pumping and hoisting as well as for ventilation and drilling. The compressor is located at the power station on Clear Creek, 8,000 feet from the mouth of the adit and the air is carried up through a 4-in. pipe laid on the surface. The compressor now in use is an old single stage machine driven by water power. The plans of the new company contemplate the immediate installation of a large, modern, two stage compressor driven by either water or steam. With the addition of the Wilkie property the company increases its holdings along the creek to a total of 4,000 feet and a new flume and power station is to be built to make the best possible use of this water. Later the Silver Age mill is to be modernized and enlarged to a capacity of 100 tons so as to be able to treat the mill ores of the consolidated mines.

The vein upon which the main work has been done is one of the largest and best known veins in the district. It is from 5 to 15 feet wide with an average of about 8 feet. The ores are both smelting and mill ores, the latter being treated by concentration. The values are in gold, silver and lead with small amounts of copper. The smelting ores range in price from $20 to $150 per ton, recent shipments averaging between $25 and $30 net. The mill ore occurs usually adjoining the smelting streak and must be handled with it in mining. The grade depends largely on the care exercised in sorting out the smelting ore but the ore milled from this property within the last year by the Colorado-California Company, the recent owners, ran about $7 per ton.

The holdings of the Consolidated Franklin Mines are shown in the accompanying figure which also shows the relations of the property to the line of the Newhouse Tunnel, to the Gem Mine, and to the Freighter and Washington lodes of the John Owen Company. Connection with the latter property will soon be made through the Silver Age adit. In addition to the main vein the property includes an important parallel vein which has been opened on the Hudson, Ship Ahoy and Summit claims and has yielded ore of good grade and in quantity quite satisfactory in view of the small amount of development work yet done on the vein. The Ship Ahoy shaft is 200 feet deep and there is one stope at the 400-ft. level which is reached by means of a cross-cut from the Silver Age adit.

The bringing together of all these properties under one ownership and management is a movement characteristic of the Clear Creek-Gilpin County field at present. The success of the Newhouse Tunnel and the demonstration afforded by that enterprise of the permanent character of the veins is encouraging the investment of the capital necessary to work low grade concentrating ores on a large scale. The Franklin is in the hands of experienced mining men who are familiar with the property and is backed by men of ample means connected with banking and lumbering interests centered mainly at Des Moines, Iowa.



MAP OF CLAIMS, FRANKLIN MINES, COLORADO.

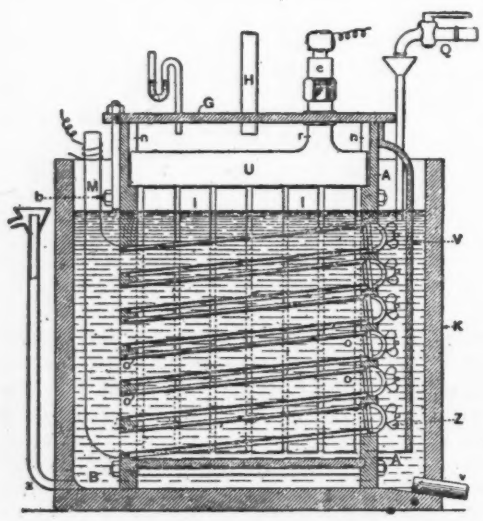
METALLIC MANGANESE.—The *Electrical World and Engineer* says that the method long since applied by Hall to the manufacture of aluminum, and later by Liebmann to the electrolytic production of beryllium, and which consists in dissolving the oxide of the metal in a fused fluoride bath and sub-

jecting it to a direct current of sufficient volume to maintain the fusion of the bath and to separate the metal, has now been applied by Albert Simon, of Bordeaux, France, to the production of manganese and its alloys. Manganese is difficult of treatment by ordinary reduction methods, and the electric furnace cannot be economically applied to its production on account of the loss of metal due to its ready volatility at high temperatures. A molten bath, however, fusing at a temperature approximating the melting point of manganese and its commercial alloys, is readily formed, and from this bath the metal or its alloy separates as a cathode product, while any silicon which may be present escapes as gaseous fluoride. M. Simon has constructed a special furnace for the purpose, the distinctive feature of which are the use of a protective sheath for the anode composed of a manganese slag containing the metal in its lower state of oxidation, and, therefore, incapable of oxidizing the carbon; and of a series of temporary carbon connectors between anode and cathode, which carry the initial current and bring the bath to an operative temperature. These structural features form the subject of a patent issued November 12.

THE OUTHENIN-CHALANDRE ELECTROLYTIC ALKALI PROCESS*

By J. B. C. Kershaw.

This process for the production of alkalies and chlorine compounds by the electrolysis of solutions of sodium or potassium chloride, is a diaphragm one, and is in actual operation at Chevres, near Geneva, and at Moutiers, in France, while



OUTHENIN-CHALANDRE CELL.

works are being built for the same process in Italy and Spain.

The figure is a sectional elevation of the cell, which consists of the outer and inner vessels, K and A. The inner vessel is filled with rows of porous-diaphragm tubes o o, in communication at one end with the chamber K, as shown. Each tube contains an iron cathode, which runs the whole length of its interior, while the anodes are round rods of carbon fixed into the lead head-piece U. from the surface of which the chlorine is carried away by the outlet pipe H.

The inner chamber A is nearly filled with a concentrated solution of sodium chloride, and the outer with dilute sodium hydrate. The electrical connections are then made.

The chlorine gas evolved is employed for the manufacture of bleaching powder, and for the manufacture of pure chemicals for laboratory and medical purposes, while liquefied chlorine is also one of the products of the works. The sodium liberated at the cathode surfaces decomposes the water, with formation of caustic soda, which, owing to its high specific gravity, travels down the tubes, and collects on the bottom of the cell, and when required is run off by the outlet pipe V.

The hydrogen liberated at the cathodes is collected and burned in a special form of burner in an atmosphere of chlorine, the resultant hydrochloric acid being fed into the anode chamber for the decomposition of hydrochlorites. The excess of hydrochloric acid is split up by the electrolysis into its component parts, with production of chlorine at the anode and hydrogen at the cathode.

The advantages claimed for this class of cells are: Complete separation of the electrolyte in the anodic and cathodic compartments, with consequent prevention of hypochlorite and chlorate formation. Collection and utilization of the hydrogen evolved.

The author is rather doubtful about the advantages of this cell, and until figures have been published, showing the yield under actual working conditions, comparison of its efficiency with the Castner and Hargreaves-Bird cells is impossible.

*Abstract of paper in the London *Electrician*.

ROBINS BELT CONVEYORS IN A STAMP MILL

The Homestake Mining Company, at Lead, South Dakota, has installed three Robins belt conveyors, each 167 feet long, at the Father De Smet shaft house. The belts receive the ore through chutes in the bottom of the bins, the leading points being close together. The conveyors then diverge from this centre and deliver the ore into the 100-stamp mill. The accompanying illustrations show the conveyors themselves and the three bridges which support them. Each belt carries about 160 tons in 24 hours. They run at moderate speed and are driven from a single shaft at the discharge end, requiring about 3 h.p. each. While the ore is in transit on the belts, it is sorted, and small pieces of wood and chips are picked out from it. These come from broken timbers in the mine, and formerly greatly obstructed the discharge from the screens. By keeping them out from the mortars, from ten to twenty tons more per day are now crushed. The three belts are fed by one boy. The plant was furnished by the Robins Conveying Belt Company of New York.

ROBINS' CONVEYING BELT IN A STAMP MILL, INTERIOR.

ROBINS' CONVEYING BELT IN A STAMP MILL, EXTERIOR.

ELECTRIC FURNACE.—A carbide furnace recenly patented by James H. Morley, of Springfield, Mass., and appertaining to that type in which a vertical depending electrode is used in connection with interchangeable carbon hearths constituting the opposite terminal, presents, in addition to the usual complement of devices for automatic charge feed and current regulation, a point of decided novelty as regards the carbide art. This lies in the construction of the upper carbon, which is fashioned as a tubular rectangular prism, and is fitted with mechanism for imparting to it a reciprocating rotary movement about its longitudinal axis, whereby the surrounding charge is continuously loosened and stoked into the arc. The central perforation communicates above the furnace with the air, and the movement of the furnace gases serves to induce through the carbon a downward current of air, which not only prevents overheating, but by introducing the air at the very point of liberation of the reaction gases, is said to prevent the occasional explosions of gas which otherwise occur near the fusion zone.

GAS ENGINE TESTS.—The London *Engineer* says that at the Winnington works of Brunner, Mond & Co., where two gas engines of 400 to 500 h. p. nominal have been working with Mond gas, tests show a thermal efficiency of 30.38 per cent, "one indicated horse power now being obtained from an expenditure of 0.88 pounds of common slack coal.

ABSTRACTS OF OFFICIAL REPORTS.

Montana Mining Company, Limited.

The directors' report for the half-year ending June 30, 1901, shows a loss for the half-year of £1,348. That a better result is not shown is due to the disappointing nature of the developments in the lower levels of the mine, the expenditure attending which amounted to £9,794. In relief of this expenditure the tailings, for the short time that the plant was employed, contributed £8,656, while the crushings contributed but £719, in consequence of the low grade of the ore met with in the upper levels of the mine. Deducted from the previous profit balance of £52,160 the net amount carried forward to the next half-year is £50,820. The expenditure during the half-year, charged to capital account, and appearing under the following heads amounted to £13,863, of which the expenditure in connection with purchase and development of outside properties under lease and bond, adjustable on completion, was £13,422. Thirty stamps of the 60-stamp mill were in operation during the entire half-year and reduced 12,222 tons of ore.

During the six months 12,222 tons of ore were extracted from the mine and sent to the mills, yielding in bullion bars and concentrates (on realized and estimated realizable values) $57,605, or an average of $4.71 per ton. The expenditure on mining and milling, averaging $4.42 per ton, amounted to $54,122, the net realized profit being $3,483. On the other hand the expenditure for prospecting, operating shafts and general developments, amounted to $47,404, the net result being a loss of $43,921. From April 6 to June 30, 1901, a total of 31,710 tons of tailings was brought under treatment, and produced cyanide precipitates, realizing as per smelters' returns, $79,304, or an average of $2.50 per ton. The expenditure, embracing the treatment and transport of the tailings, amounted to $37,410, equivalent to $1.18 per ton, and the net profit obtained was $41,893, or an average of $1.32 per ton.

The proportionate money value of the precious metals contained in the produce showed that gold formed 91.8 per cent of the values extracted from the ore and 87 per cent of those from the tailings, silver forming 8.2 and 13 per cent, respectively.

The directors have nothing to add to their special circular of December 10 last, informing shareholders that the matters in dispute between this company and the St. Louis Mining and Milling Company had been submitted to the Supreme Court of the United States, in Washington.

The balance sheet shows expenditure in respect of the property purchased, which is in course of equipment with a modern 20-stamp free gold mill with Frue vanners. The directors hope shortly to be in a position to give shareholders full particulars respecting this property. Since the last report was issued, the search for other properties has been continued without intermission, the result being that an option has been secured on a group of claims in the State of Montana which promises well, but further developments are needed before the directors can decide whether they will exercise the option or not.

Manager Burrell's report shows the operations for the half-year. In pursuance of the policy of the board, which received the unanimous assent of the shareholders at the last half-yearly meeting, operations on the 1,000 and 1,600-feet levels were suspended on July 23 and 27, respectively, and by August 18 the pumps and other machinery of value were brought to the surface without loss or mishap. In order to leave nothing unexplored in the vicinity of No. 3 shaft ore-body, the directors accorded Mr. Burrell the utmost latitude in interpreting the policy of the board; both the 1,000 and 1,600-feet levels having been carried some distance beyond the points contemplated at the date of the last report.

Mr. Burrell's report further says: "We may find it advisable, after making experiments with our tailings, to discard the vanners and put in a cyanide plant to treat the pulp directly from the plates, but this change can be made while the mill is in operation.

"The usual efforts were made to find a property suitable for this company and many properties were examined and refused. We have bonded a group of claims in Montana on which we are doing some development work. As we are yet unable to determine whether these two properties will prove important enough for this company, we shall continue our search.

"Acting in accordance with the policy decided upon, we extended the lower levels as far as it was then deemed advisable. We were, later, instructed to abandon the lower levels of the mine and remove all the pumping machinery and other property worth saving. We then proceeded to draw the pumps, pipes, etc., and with the aid of four concrete dams, the water was held in check, and the pumps, pipe and tracking entirely removed without an accident of any kind. Preparation for this work began on July 26, and on August 16 the dams were closed and by August 18 both pumps had been brought to the surface, and the work of removing the water, air and steam columns was all finished by August 30. The water is now up to the 1,000-ft. level, and is rising gradually. We do not intend to do any development work below the 400-ft. level until it is positively determined where the water level will be. No. 1 shaft has been left in good order, the timbers and guides are all in place, but the pipes, chairs, and rollers are being removed as the water rises. No. 3 shaft at the south end of the mine is also intact and can be operated to the 800-ft. level until the water rises above that point. We are at present dropping 40 stamps of the 60-stamp mill (now only a 40-stamp mill) on ore taken from various parts of the mine, as already reported. We are making experiments at the cyanide plant with an eight-ton vat on the fine sands, or slimes, which we have been unable to treat by the present percolation process. We shall have to demonstrate by experiment what is required to treat these slimes, as we did in regard to the sands before building the present tailings plant. The slimes must be agitated by some inexpensive mechanical device, allowed to settle and then decanted. At the present stage of our experimental work we find the slimes yield a fair extraction after being dried in the dams by being ploughed and turned over. This is one of the difficulties, for should the weather be stormy, the material is all exposed to the snow and rain. We have arrived at the conclusion that three of our seven vats should be prepared for this work during the coming winter. After we have been running our small plant for two or three months longer we shall be better able to decide."

SAULT STE. MARIE CANAL TRAFFIC.

The official statement for October shows that the traffic to and from Lake Superior, through the Sault Ste. Marie Canal, has this year exceeded all records. From the opening of navigation up to November 1 there were 17,421 vessels passed through the canal. The total freight carried was 24,543,610 net tons, 4,560,898 tons being west-bound and 19,982,712 tons east-bound. As compared with the corresponding period in 1900, the total freight shows an increase of 1,452,844 tons, or 6.3 per cent. Unless the closing of navigation comes very early, the total for the current year will be not far from 30,000,000 tons.

The items of mineral freight included are shown below, in net tons, except salt, which is in barrels:

	1900.	1901.		Changes.
Anthracite coal	435,422	657,147	I.	221,725
Bituminous coal	3,585,333	3,318,643	D.	267,690
Iron ore	15,255,038	16,283,109	I.	1,028,071
Pig and mfd. iron.....	117,325	147,430	I.	30,105
Copper	110,423	83,212	D.	27,211
Building stone	36,657	42,884	I.	6,227
Salt, barrels.....	277,338	396,236	I.	118,898

The only decreases shown are in bituminous coal, due to shortage of cars for delivering coal at the lower lake ports; and in copper, the result of heavy rail shipments early in the year. The increase in freight tonnage this year would have been still greater, had it not been for delays at the lower lake ports, where vessels were frequently unable to unload, owing to the rush of freight.

The average cargo this season has been 1,409 net tons, against 1,324 tons last year, and 1,220 tons in 1898; showing the general increase in size of lake vessels.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

SPECIALLY REPORTED.

DUTY ON CARBONATE OF BARYTA.—The provisions of paragraph 489 of the free list, act of July 24, 1897, cover only that species of carbonate of baryta, which is the natural mineral product known as witherite. The words in that paragraph "or witherite" limit its provisions to that particular variety of carbonate of baryta. Trade and commerce recognize two kinds of carbonate of baryta, and that species made artificially is always known as carbonate of baryta, precipitated, and paragraph 489 excludes it from its provisions. —Appeal of Gabriel & Schall, from Collector of Customs at New York; Board of General Appraisers.

BOOKS RECEIVED.

In sending books for notices, will publishers, for their own sake and for that of book buyers, give the retail prices. These notices do not supersede review in a subsequent issue of the ENGINEERING AND MINING JOURNAL.

Outlines of Electrochemistry. By Prof. Harry C. Jones. New York; the *Electrical Review* Publishing Company and the D. Van Nostrand Company. Pages, 106; illustrated.

Recherches Minieres. Guide Pratique de Prospection et de Reconnaissance des Gisements. By Felix Colomer. Paris, France; Veuve Ch. Dunod. Pages, 272; illustrated. Price (in New York) $2.50.

Linear Drawing and Lettering for Beginners. By Prof. J. C. L. Fish. Palo Alto, Cal.; published by the author. Pages, 70; with 46 figures. Price, $1. Also, for use with the above: *Blank Book for Lettering.* Ruled sheets for practice. Price, 25 cents.

The Anthracite Coal Industry. A Study of the Economic Conditions and Relations of the Co-operative Forces in the Development of the Anthracite Coal Industry of Pennsylvania. By Dr. Peter Roberts. With an introduction by Prof. W. G. Summer. New York: the MacMillan Company. London: Macmillan & Company, Limited. Pages, 262; illustrated. Price, $3.50.

NEW PUBLICATIONS.

Smoley's Tables. Containing Parallel Tables of Logarithms, and Squares of Feet, Inches and Fractions, from Zero to 50 feet. By Constantine Smoley. New York; Engineering News Publishing Company. Pages, 212. Price, $3.

The work contains tables of logarithms and squares of feet, inches and fractions thereof expressed in decimals of a foot and varying by 1-32d of an inch from zero to 50 feet, thus covering a special field of calculation in a more detailed manner than is usually treated in tables of this kind. There are many instances where it is desirable to obtain results in thirty-seconds of an inch without interpolation and for such calculations the work possesses a decided advantage. Its distinctive feature is the combination in parallel columns of the logarithms of the fractions of feet and inches together with the squares, an arangement which will appeal to those engaged in structural engineering. For the benefit of those who are not familiar with this class of work a few explanations and examples are given in the last few pages, of the book

to show the application of the tables. While tables of this character have already been published, notably those of Hall and of Buchanan, the present book under review is worthy of special commendation for the advantages described above. The typography, paper and binding are of excellent quality.

Statistics of the Mineral Production of India for the Ten Years 1890-1900. Compiled under the supervision of J. A. Robertson, Director General of statistics. Calcutta, India; office of the Superintendent of Government Printing. 1901. Pages 12.

This small pamphlet contains much that is of interest to the mineral production of India and in addition to the statistical tables pertaining to the quantities and values of the products during the decade 1890-1900, a brief summary is given of the principal industries, notably, Gold, Coal, Salt, Petroleum, Saltpeter and Iron, in the order of their importance. The production of the principal minerals during 1900, the last year of the decade under review, was as follows: Gold, 513,266 ounces (R. 2,83,-77,063); Coal, 6,118,692 tons (R. 2,01,46,222); Salt, 1,055,056 tons (R. 48,81,013); Petroleum 37,729,211 gals. (R. 22,31,325); Saltpeter, 230,472 cwt. (R. 16,29,657) and Iron, 63,073 tons (R. 1,67,567). These mineral products are also classified as to the individual production in each province. Under the production of gems and precious stones are grouped amber, diamonds, garnets, jade, rubies and tourmaline; a second division is composed of the less important minerals, alum, asbestos, copper ore, corundum, gypsum, manganese ore, mica, graphite, soap-sand, soapstone and tin ore; while under a third division devoted to quarry stones and building material are included clay, granite and gravel, rubble, laterite, limestone, sandstone, slate, trap and other stones used in construction work.

The report concludes with a classification of the prospecting and mining licenses granted in each province during the years 1898, 1899 and 1900.

Mining Statistics of Western Australia to December 31, 1900. By James Wallace, Statist Department of Mines. Perth, W.. A.; Government Printer. 1901. Paper covers, quarto size. Pages, 153.

This extensive report reflects great credit on the work of the Government staff for the detailed manner in which the statistics of the mineral production of the State have been collected and compiled. Gold is the principal product, and the tables of production during the year 1900 include not only the output of the numerous companies engaged in this branch of the mineral industry, but considerable data pertaining to the area, leases in force, details of plant equipment, average number of men employed, method of treatment, tons of ore treated, average value per ton, mint receipts and value. In addition, tables have been compiled grouping the data together under the different mining districts. This table is the most important one of the report and covers 114 pages of closely printed matter. Another table of special note contains an abstract of the progress made during 1900 in the various methods employed in the extraction of the gold from its ores, including smelting, concentration and the treatment of concentrates, tailings and slimes.

The average fineness of gold for the State for the year 1900 is reported at 880.5, which makes the value per crude ounce £3 14s. 9 3-4d.

Statistics have also been tabulated showing the details of the production of block tin, copper ore, ironstone, lead ore, coal, limestone and diamonds. The report concludes with a comprehensive table of the quantity and estimated value of the mining machinery in existence on December 31, 1900, and a synopsis of the accidents with their causes in the various districts during the year. Among the 17,735 men employed in mining, 45 fatal accidents occurred, and 101 were injured.

The total value of the mineral output for the year 1900 amounted to £6,179,536, as compared with £6,346,892 for 1899, the gold output for the two years being valued at £6,007,611 and £6,246,732, respectively. In spite of this slight decrease, the progress of the mining industry is referred to very favorably. Many new smelting plants have been erected during the year and the value of the machinery in existence at the end of the year is estimated at £3,023,089, as compared with £1,962,222 at the end of 1899. J. S.

CORRESPONDENCE

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the MANAGING EDITOR.

We do not hold ourselves responsible for the opinions expressed by correspondents.

Determination of the Silver in Chalcopyrite Bearing Silver.

Sir: In order to determine the silver in chalcopyrite carrying only 200 grams silver per ton, it is necessary to weigh 100 to 150 grams and to roast them in a dish. The ore must be pulverized as fine as possible. The roasting is finished when the smell of sulphurous acid is no longer apparent. After roasting, the ore is dissolved in a mixture of nitric acid, muriatic acid and sulphuric acid : 150 c. c. (S. G. 1,420); 50 c. c. muriatic acid (S. G. 1.180), and 100 c. c. sulphuric acid (S. G. 1.580).

After dissolving in a dish, when the effervescence quiets down, evaporate to dryness and disappearance of the white fumes of anhydrous sulphuric acid. Add a little water containing sulphuric acid till all the anhydrous sulphates are dissolved. The solution, without filtering, is put in a beaker of 1.2 liters capacity. If there is very much silica it is better to filter. Dilute with cold water to 1.5 liter, and add 4.5 grains of pure chloride of sodium dissolved in water.

Let it settle during a night in a warm place, and after settling and cooling collect the residue—silica, lead sulphate, chloride of silver, etc.—on a filter, and wash with great care. When the filter is dried, incinerate in a scorifier, very slowly, with a little sodium bicarbonate, if it is necessary. Scorify with 5 or 10 grams of pure test lead, and pour it in a mould. The lead button is cleaned and expelled with care. The silver button is weighed.

This method is very exact, more than the direct fire assay, and with care it is useful to employ for the corrected assay.

This method is good for nearly every poor ore bearing silver. P. TRUCHOT.

Santa Rosalia, Mex., Nov. 1, 1901.

QUESTIONS AND ANSWERS

(Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc.; preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert. Nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preferences will, of course, always be given to questions submitted by subscribers.

Books referred to in this column can be obtained from the Book Department of the ENGINEERING AND MINING JOURNAL).

Cement Manufacturers.—Please let me know where I can get a list of the names and addresses of all cement manufacturers in Wisconsin, Michigan, Minnesota, Indiana and Ohio; also a list of those that have started within the last two years.—W. A. F.

Answer.—You can obtain the names desired by writing to the State geologists of the States mentioned, who will doubtless be pleased to give you the information.

Petroleum in the Lead Blast Furnace.—Can you tell me where I can learn of the use of petroleum in the lead blast furnace.—J.

Answer.—There are, we believe, no data accessible on this point. In smelting in the blast furnace solid fuel has been considered necessary, though petroleum has been used occasionally as an auxiliary. If any of our readers have data upon this subject, we shall be pleased to hear from them.

Garnet Sand.—Can you inform me if there is any demand for garnet sand? Also what the price is? Where can it be sold? I have large quantities of it. —F. C. B.

Answer.—Garnet sand is used as an abrasive, chiefly in the manufacture of sand-paper. In 1900 there was a total of 3,285 short tons mined and sold in the United States. This supply came from the mines at North Creek, in the Adirondack region of New York; at Chelsea, Pa., and at Roxbury, Conn. The price varies somewhat according to quality; the present quotations are $25 and upwards per ton of 2,000 pounds in New York. The makers of sand-paper are all located in the East, so that the value of your material, aside from its quality, would depend largely upon what freight rates you could secure. Messrs. Herman Behr & Co., 78 Beekman street, New York, handle a large part of the product.

Ganister.—How does ganister rock occur; what is its formation and what are the associated minerals? —E. D. H.

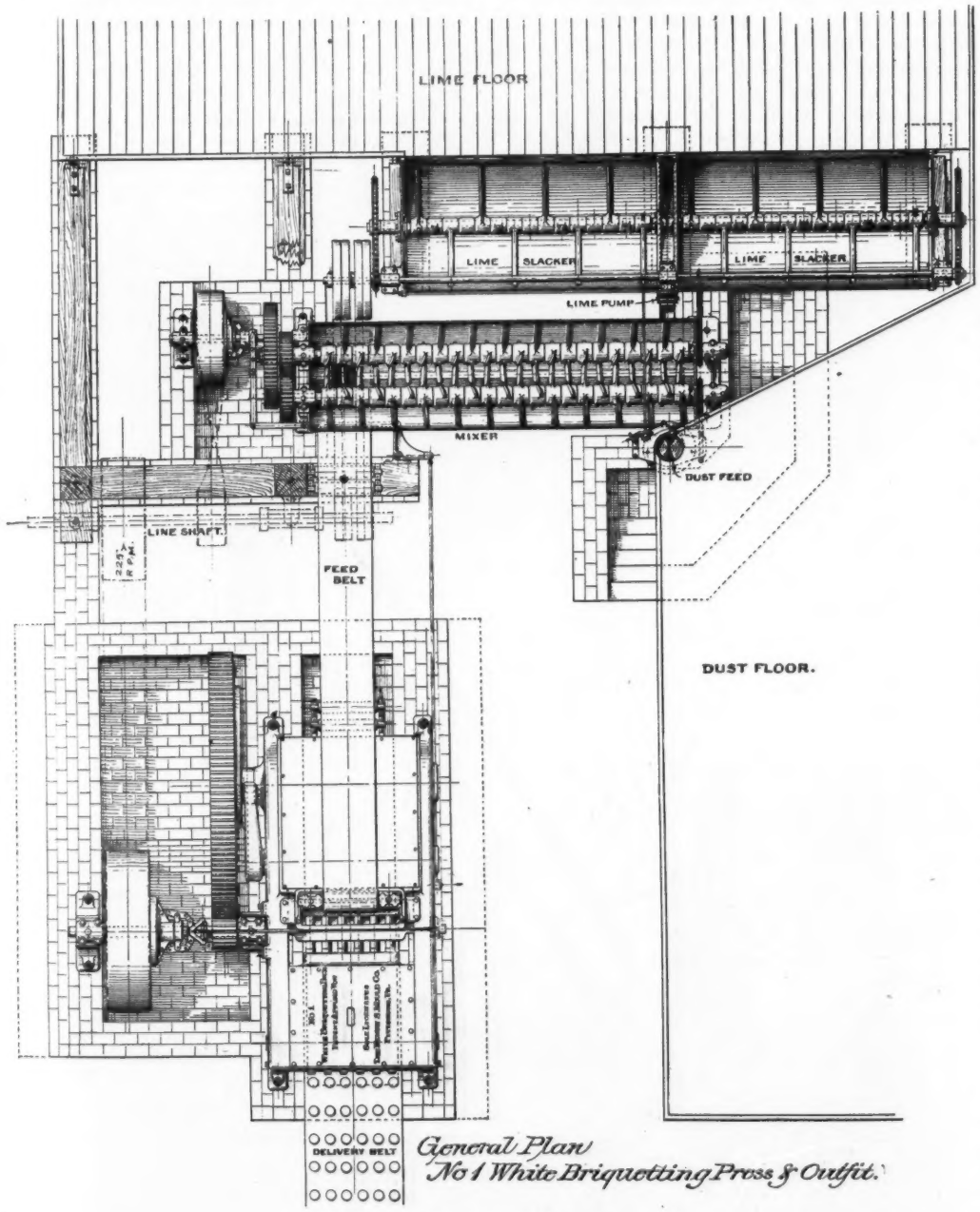
Answer.—The material originally called ganister is used extensively at Sheffeld, Eng., for making silica brick, and is a clay occurring in the millstone grib of the lower coal measures. The term ganister has come into quite general use for any siliceous material suitable for silica brick or furnace lining. Such material is found in many localities, and is not confined to any single geological formation. Analyses of so-called ganister vary considerably. Much of the silica used in the fire brick and silica brick plants of Western Pennsylvania comes from the Medina sandstone, a Silurian formation. Some comes from sandstones in the coal measures. Near Unionville, Pa., is a quarry of siliceous rock that can be dressed and used as furnace lining without being made into brick. An article on the "Principles of Fire Brick Manufacture" appeared in the *Mineral Industry*, Volume VII.

A BRIQUETTE PLANT FOR FINE ORES.

A subject of interest at the present time opened by the experiments that have been carried on to render of value what has heretofore been considered as mine or furnace waste. These experiments have covered a period of six years, and have been conducted by the Henry S. Mould Company, of Pittsburg, Pa. The solution of the problems involved has been found by putting the fine ores and waste into solid block form, each field offering peculiar questions of its own for solution, and each demanding a treatment of its own. The briquetting of precious metal ores is already an accomplished fact. The fine roasted ores, concentrates, slimes, flue-dust, etc., after being pressed into solid form can now be used in the smelter to advantage. The briquetting of these fine ores, in many cases does away with the matting or intermediate furnaces which are in use in many places for putting the fine material into slag or matte form order to prepare it for use in the smelter.

The Henry S. Mould Company has solved the fine ore problem by its White briquetting press and outfit, a ground plan of which is shown herewith. The general binder used for metal ore briquetting is slacked lime, and with the White briquetting press, about 3 1-2 per cent is required. Where the plant is equipped for automatically delivering the briquettes into small storage bins for drying only 5 men are required to handle an output of 100 tons in 10 hours. The lime slackers are fed from a platform using first one and then the other slacker, so that while the lime is being slacked in one, the pump is drawing from the other in which the lime has been slacked. Both lime slackers communicate by large openings at the bottom of the hollow

middle casting. A cut-off gate is arranged from each of these openings to be operated from above. The openings are screened to prevent lumps from getting into the camp. These slackers are each driven independently by tight and loose pulleys, the one on the right being driven by a shaft extending across the top of the slackers. Belt shifters are supplied to be operated by cords from the lime floor. Either slacker may be started or stopped independently of the other. The lime pump is placed as shown, and is driven by a chain from one of the mixer shafts. The stroke of the pump is regulated by a rod and hand wheel mounted on the dust feed, whereby the amount of lime may be accurately adjusted as desired.



WHITE BRIQUETTING PLANT.

The automatic dust feed is arranged as shown, the materials to be briquetted being fed into it through an opening in the dust floor. The top of the floor is 2 feet 9 1-2 inches above the general floor line. The dust feed is automatically regulated by a rod and hand wheel, both hand wheels being conveniently located for quick adjustment. The dust feed is driven by chain from one of the mixer shafts.

The double mixer is provided with friction clutch pulley, driven from a pulley on the line shaft. The mixer is heavily geared. All bearings are lined with the best babbit metal, are provided with automatic chain oilers, and are dust proof. The clutch pulley is operated by a train of levers and rods from a hand lever on the side of the press. The feed belt from the mixer to the press is driven by a pulley on the pulley shaft of the mixer. It is supported by four rollers. At the upper end directly over the hopper of the press, is a pulley provided with a sufficient adjustment to keep the belt tight and quickly removable, if desired. The press is located as shown, and is provided with a friction clutch pulley driven from a pulley on the line shaft, the clutch being operated by a handle on the side of the press, conveniently near the operator. By this arrangement the operator standing at the hopper of the press has control of all the machinery from that point. By stopping the mixer, he stops the feed belt, dust feed, and lime pump. From this point he has also a full view of the lime slackers, lime pump, and the flow of lime therefrom; also the dust feed and the stream of dust from it, the mixer throughout its length, the feed belt from the point at which it receives the mixed material to the hopper of the press, and also the delivery belt. From this point he also has control of the men who feed the dust and lime.

The foundation around the dust feed provides for steps and a passage way under the corner of the dust floor, giving full head room under it and affording convenient access to the dust feed and lime pump mechanism, and to the end of the mixer. The two posts supporting the line shaft are at the left of the feed belt, leaving the mixer free of access from all sides. .

Machines of this type are now in active operation at a large number of smelters in this country, British Columbia, South America, Mexico, and Australia, where they are giving excellent satisfaction. Among the companies using the White briquetting press, may be mentioned, the American Smelting and Refining Company, which has already established a number of plants; the Nichols Chemical Company, of New York; the Bingham Consolidated Mining and Smelting Company, of Salt Lake City; the Hall Mining and Smelting Company, of Nelson, B. C.; the Broken Hill Proprietary Company, of Port Pirie, Australia; the Tasmania Smelting Company, of Zeehan, Tasmania, and the United Verde Copper Company, of Jerome, Ariz. The Anaconda Copper Mining Company, of Anaconda Mont., and the Compania Minera de Penoles, of Mapimi, Mexico, have double press plants. In addition to these there are many other plants now using the White press to advantage.

Another field in which the briquetting machines are rapidly coming into use, is found in the smelting of low-grade iron ores, and of fine ores and flue dust. Briquetting makes it possible to use to advantage magnetic iron ores containing but a small percentage of iron, and which would not justify the cost of smelting in their natural condition. The method employed is to crush the ore fine, and then by the use of magnetic separators, a concentrate of from 68 to 70 per cent of iron may be secured. This resultant, in the form in which it comes from the separator, could only be used in a small proportion to the furnace burden, on account of the many difficulties known to every furnace manager. Here the briquetting machine comes into play, transforming the fine ore into solid blocks ready for immediate use in the blast furnace. Several plants of this kind are now being completed in various parts of the country. In connection with the use of briquetting machinery in the smelting of iron ores, there might also be mentioned the large saving effected by the solidifying of the flue dust. At present there is not only a large loss in flue-dust when the furnaces are opened for a new charge, but also a loss in the dust that goes through with the blast. In the endeavor to save flue dust by using it in the furnace in its fine condition, it is found that trouble arises from clogging and the forming of gas pockets, with consequent explosions, the damage from which cannot be estimated. With flue-dust put into compact and solid form by the use of briquetting machinery, these difficulties are overcome. Another point gained by using briquetting machinery is that the furnace is more easily worked and the capacity greater, when a soft smelting ore in block form is used.

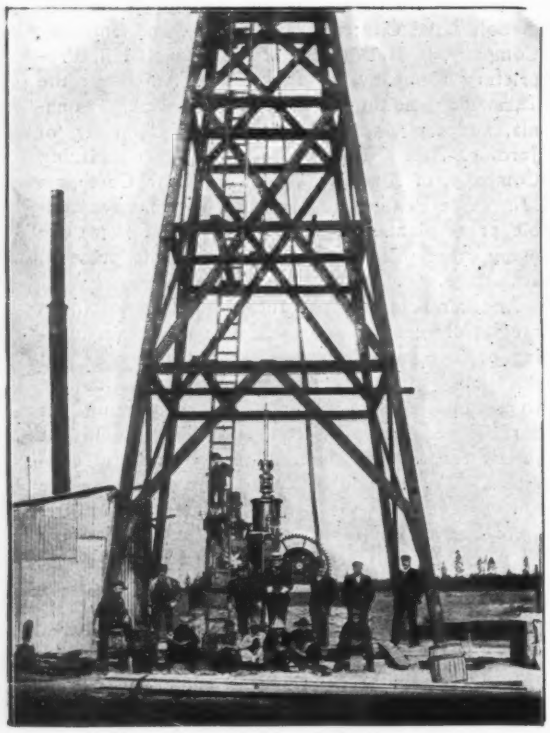
Still another line that has been followed, is offered by the enormous culm banks or slack piles, and the piles of coke dust, that are found in the coal mining regions of Pennsylvania. Heretofore these great heaps of waste have been looked upon not only as valueless but also as a source of annoyance and hindrance to the working of the mines. With the introduction of the new cutting machines, much dust is formed that is never removed from the mine, but is left to clog up the narrow passages. The briquetting of fine coal and coke has been carried on with pronounced success in Europe and is now being taken up here. The Henry S. Mould Company has erected a new testing plant in Pittsburg, where work along this line will be begun this month.

THE TURF CLUB BOREHOLE AT JOHANNESBURG.

A remarkable case in diamond drilling, to which reference has heretofore been made in our columns, is the hole put down on the Turf Club grounds, at Johannesburg in the Transvaal. This work was in charge of Mr. Edward Chester, of the Chester Diamond Drilling Company, who has given some interesting particulars in relation to the work.

The bore was started in January, 1899, but was stopped on October, when the engineers were advised to leave Johannesburg. Moreover, owing to the war-

like feeling, which existed at the time, the workmen refused to work. When they were able to return, it was found that there was much damage done, but it was repaired before recommencing work. They got the rods out on May 26, 1901, but the actual bor-



DIAMOND DRILL RIG, SULLIVAN MAHINERY COMPANY.

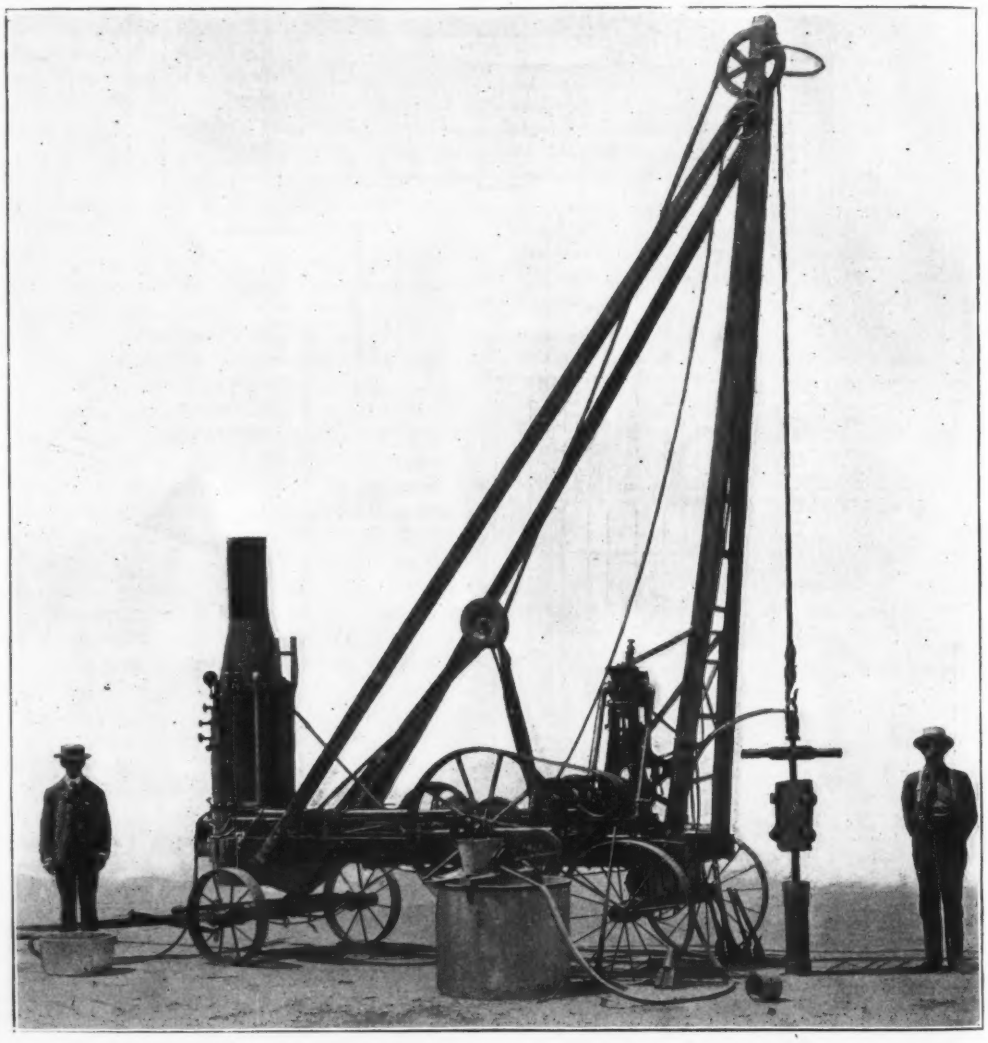
ing operations did not commence until June 14. A Sullivan drill, which was specially built, to go this depth, was used. This is the deepest hole put down at Johannesburg. The Rand Victoria borehole held the record on the Rand until the Bezuidenville hole was drilled. The Rand Victoria borehole struck the reef at 2,400 ft., and about 8 months was taken in performing the operation. The Bezuidenville borehole was finished in December, 1895, and was the deepest out there at that date, the reef being struck at 3,251 feet. The drill on the Turf Club ground is nearly two miles from the outcrop of the main reef. The Rand formation was cut within 25 feet of the depth at which it was expected to be struck—4,800 feet. A curious feature in connection with the sinking of the Turf Club borehole is that the rods were left in the hole for 20 months, while hostilities were going on. The work required in restarting is shown by a portion of the report from the engineers, as follows: "Having completed all our preparations, we started to withdraw the rods on Sunday morning, May 26, at 9.10 a. m. The full pressure of steam at our disposal was applied, and, as the rods took the strain, it was a moment of great anxiety to the onlookers, and we held out breath in suspense, as it was seen the rods had not moved an inch. The next moment, however, to our great relief and delight, they gradually and evenly slipped outwards, and so continued to lift, without a hitch, throughout the day, so that at knocking off time we had pulled 1,850 feet. Work was resumed at daylight on the following Monday morning, and by 10 a. m. on that day all the rods were safely out of the hole."

The borehole was in fairly favorable ground and the regular Rand formation.

An interesting point in regard to this borehole, and the value of the result obtained thereby, is that it has proved nearly two miles of backs. Of course, it was always calculated that the main reef series continued to a far greater depth than the point at which it was cut; but until the series was cut, it was always open to doubt as to whether the formation continued intact to this great depth, and from the result now obtained, there seems no reason why it should not continue right up to the edge of the Klipriversberg Range, about four miles south of the outcrop. Moreover, it would appear that there is every likelihood of picking up the main reef series on the south side of the Klipriversberg dike, the formation at which point is covered by the Black Reef series, and no one has yet had pluck enough to penetrate the formation underneath this to any depth. There is no doubt that it continues there, as in portions of Randfontein, some 20 miles west of this point, where the series is overlapped with the Black Reef, and where the formation is proved to dip consistently.

A second borehole on the Turf Club ground is to the west, and about the same distance from the outcrop, and is down to a considerable depth. This borehole was discontinued, however, until the one to the east struck the formation, but, in all probability, the second borehole will be carried down to the same depth. The company used, in drilling, Brazilian carbon, which was worth about £9 per carat. The weight of the rods which carried out this operation was about 16 tons. To prevent such an enormous weight pressing too heavily on the carbons while drilling, the rods were suspended on a hydraulic cylinder, which allowed the rods to descend as desired.

The hole was sunk in 10 1-2 months from the time the drill was put on the ground, inclusive of stoppages, but exclusive of the time the drill was hung up owing to the war. The accompanying illustration shows the Sullivan drill used in the work.



CYCLONE DRILLING MACHINE FOR TESTING PLACER GROUND.

THE CYCLONE DRILLING MACHINE FOR TESTING PLACER GROUND.

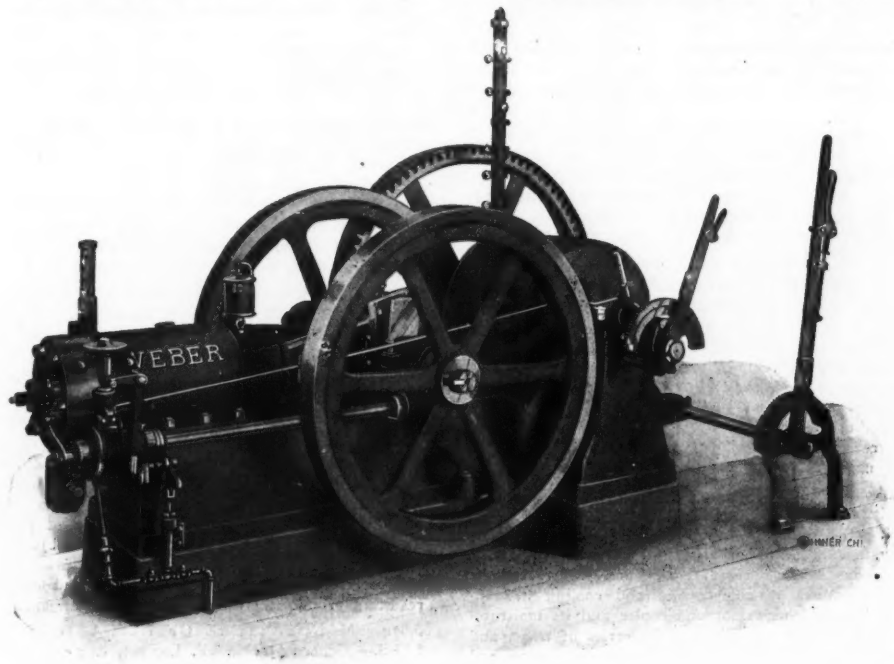
The accompanying cut is a reproduction of a photograph of the "Cyclone" placer testing and panning outfit, taken at Boise City, Idaho, in July. This machine is very similar to the ordinary cable drill, except that it is simpler in construction and operation. The drill shown is the No. 3 placer outfit, fitted with 6 h. p. boiler and engine, derrick 20 feet high, and drilling tools especially designed for this purpose, consisting of hollow tubing made very heavy and used instead of the solid drill stem. The drilling rods are screwed together in sections as the hole is sunk, making a continuous hollow tube from top to bottom. The bit at bottom of drilling rod is short and very heavy, being connected to the drilling tube with extra heavy couplings. On either side of the bit is drilled a hole intersecting with one being drilled through the center of the bit; on the top of the bit is placed a steel washer and ball, forming a valve for retaining the cuttings and discharged through a packing box and into the gold pan. The bit is run on a level with the drive-shoe, thus allowing no material to be taken from the surrounding strata. The casing is driven with the drilling rods and pipe driver, or, in other words, the drilling, driving, pumping and panning is done at one and the same time. By this method, the exact value of any given strata can be accurately tested. For example, the drill can be gauged for 3 or 6 feet, and all the cuttings brought from the drill for that distance, automatically conveyed to and washed by the Robinson gold pan as rapidly as the drilling progresses. The pan is then detached and the contents can be readily examined and the amount of gold quickly ascertained.

One of these drills has been worked by the South Boise Mining & Development Company on its property on the Boise River, making a crosscut of same. The material drilled was granite boulders, lava, gravel and sand.

This drill is made by the Cyclone Drilling Machine Company, at Orrville, Ohio.

THE LATEST WEBER GASOLINE HOIST.

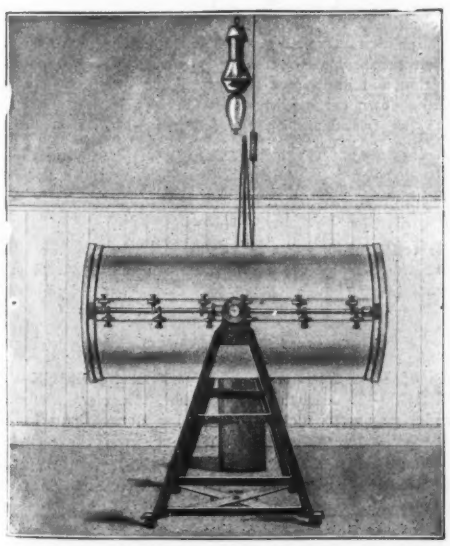
The accompanying illustration shows the latest type of gasoline hoist for mines made by the Weber Gas and Gasoline Engine Company, of Kansas City, Mo., which has been building gasoline engines for 16 years, and claims that the hoist illustrated is fully up-to-date, containing all the latest improvements.



WEBER GASOLINE HOIST FOR MINES.

These hoists are in use at 13,500 ft. altitudes, and at some points in Mexico and Arizona down in mines that are actually below the sea level.

These hoists are fitted with ring oiling main bearings; circuit breaker for prolonging the life of the battery; toggle-joint clutch mechanism, preventing any thrust on main shaft; heavy and positive brake; speeding device for controlling the hoisting speed; indicators, showing the location of load. The hoists are of heavy and rigid construction throughout, and well adapted for the rough work required in mines.

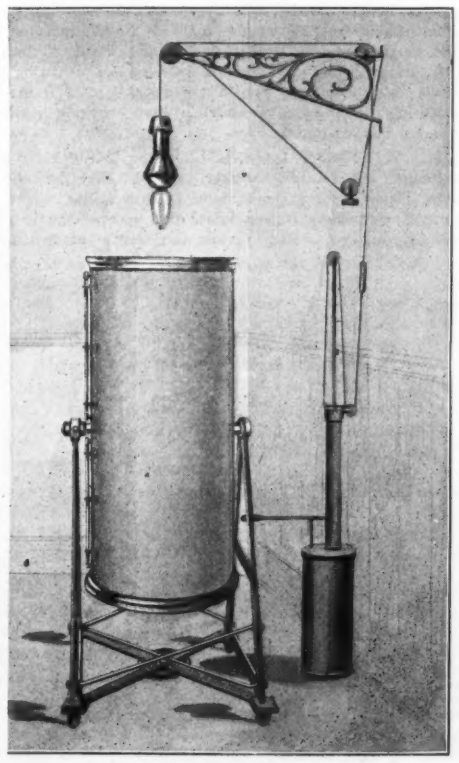


DIETZGEN CIRCULAR BLUE-PRINT MACHINE.

THE DIETZGEN CYLINDRICAL BLUE PRINTING MACHINE.

The accompanying illustration shows the cylindrical machine for making blue-prints by electric light, made by the Eugene Dietzgen Company, of Chicago. The importance as well as the general utility of the application of electricity to blue printing appeals to every engineer and draftsman, to whom the production of blue prints with the best of solar facilities has doubtless often been vexatious.

The two illustrations show the simplicity of construction and manipulation of this outfit, and any one who has ever made blue prints can handle the machine. The cylinder consists of two curved heavy plates of glass, durably mounted in a steel and iron frame held in suitable trunnions upon a stand, whereby the cylinder can be revolved into a horizontal position, and the stand is mounted upon a pedestal upon which it can be revolved while the cylinder is in a perpendicular position. The arc lamp is of a special pattern, simple in construction, with few parts and not liable to get out of order, easily attended to and owing to our system requires little attention. The 110 volt direct current is preferable; lamps for any other current can be furnished. The automatic lowering mechanism is of a unique pattern. It will not clog or stop, works evenly and is adjustable. All necessary electrical attachments are sent with each machine, requiring the purchaser to do little more than wire to the applicance and make connections.



DIETZGEN CIRCULAR BLUE-PRINT MACHINE.

In operating, the cylinder is revolved to a horizontal position and the tracings and sensitized papers are laid on the glass where they are held in place by means of a flexible blanket provided with adjustable clamps regulating any degree of pressure desired and the ordinary stretching and loosening up that usually occurs can be done away with; the blanket is so arranged that it can be partly opened to examine test prints (when a new paper is being tried), without disturbing the tracings or papers. This operation performed, only one-half of the apparatus has been put into play, therefore the cylinder is swung over to the other side and the same manipulation repeated. Attachments to the lowering mechanism can be adjusted for the lamp's descent into the cylinder for its full length in minutes and parts of minutes and also for the stopping of the lamp in its descent at any desired point. The stopping of the lamp automatically cuts off the current. Constant attention is not necessary as these attachments can be set for a continuous use of the same kind of paper or certain sizes of sheets not occupying the full length of the cylinder or can be quickly altered with each operation at the will of the operator.

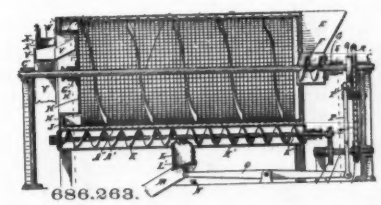
PATENTS RELATING TO MINING AND METALLURGY

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon receipt of 25 cents.

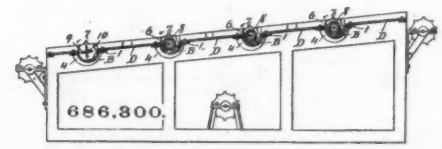
Week Ending November 12, 1901.

686,263. ORE SEPARATOR.—John Conley, Denver, Colo. The combination of a rotary screen, a conveyor in proximity to the lower side of the screen, a casing to contain water and having its walls near the screen and conveyor,



whereby the agitation of the conveyor causes the sand to pass upward through the screen, means for removing ore from the bottom of the casing, and means for passing sand through the screen.

686,300. AMALGAMATOR.—Frederick J. Hoyt, Chicago, Ill. In combination with an inclined frame, a series of inclined amalgam-plates for carrying a flow of ore-pulp, a series of receptacles between said plates containing amal-



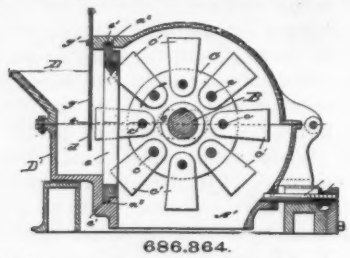
gamating material, a plain smooth-surfaced amalgam-cylinder in each receptacle immersed in the amalgam-bath thereof, said cylinders revolving in the direction of the flow of the ore, said plates extending substantially to the horizontal axis of the cylinders.

686,333. PROCESS OF MAKING ARTIFICIAL STONE.—Paul J. Prior, Cologne, Germany, assignor to Heinrich Hunnekes, Straelen, Rhineland, Prussia, Germany. The method consists in first passing steam over a body of alkali salts and thereby impregnating the steam with the salts and finally subjecting the stone material to the action of said salts-impregnated steam in an inclosing chamber.

686,365. DIE FOR DRAWING METAL RODS.—George E. Thackray, Westmont, Pa. In a die-block, the combination with a plate, of a series of polygonal blocks, adjustably mounted therein, each of said blocks being provided with contiguous convex die and concave contact surfaces, clamping-surfaces on said blocks, one of said clamping-surfaces being arranged at an angle with both said die and contact surfaces, and adjusting means for a plurality of said blocks.

686,364. CRUSHING-MILL. — Thomas L. Sturtevant, Quincy, and Thomas J. Sturtevant, Newton, Mass. The combination with a hopper and a case inclosing pivoted revolving beaters, of a grate interposed between the hopper-space and the chamber of the said case and so arranged that the ends of the said hammers or beaters may

extend through the space between the bars of the said grate into the said hopper-space, said hopper having an



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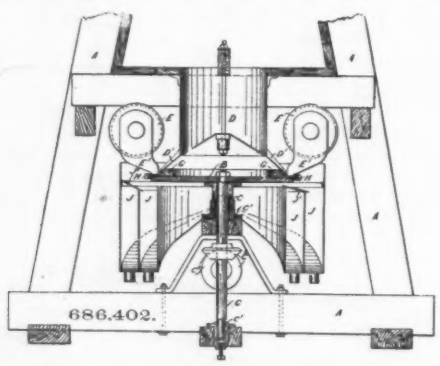
upper feeding-chute and a lower receiving-pocket communicating with said chute in which the material to be crushed is held in a substantialy fixed mass while being subjected to the action of the said beaters so that the said material may be reduced in the said receiving pocket by percussive action.

686,370. BRICK MOLDING AND PRESSING MACHINE.—Arnoldus E. Volkersen, Hamburg, Germany, assignor to the firm of Amandus Kahl, Hamburg, Germany. The combination with a table containing the molds, of a supporting-table, pistons forming the bottoms of said molds and supported by said supporting-table, means for actuating the pistons and means for adjusting said supporting-table relative to the mold-table to very the depth of the mold and the thickness of the bricks formed.

686,395. APPARATUS FOR ELECTRO-COPPERING METALS.—Emile L. Dessolle, Levallois-Perret, France. The combination of a principal trough containing the electrolyte wherein the anodes and cathodes are plunged, with a double wooden bottom provided with holes or pipes for the passage of the liquid from the lower chamber to the upper chamber of the trough; with an upper trough in communication with the principal trough by a wooden pipe ending in the principal trough between its two bottoms; with a coil in the upper trough for the circulation of a hot fluid; with a lower trough communicating with the two other troughs by means of wooden pipes and destined to receive the surplus liquid dropped from the principal and the upper trough and provided furthermore with a pump and a feeding-pipe, both of insulating material, the pipe ending above the upper trough and feeding the latter by means of the said pump.

686,402. MAGNETIC SEPARATOR.—Thomas J. Greenway, East Adelaide, South Australia. A magnetic separator, comprising a horizontally-revolving plate of magnetic material, electromagnets so arranged above and below said plate that poles of one polarity are opposite those of the other polarity and located to magnetize said plate by



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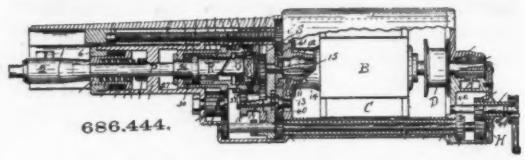
induction at certain points of its travel, means for feeding material onto magnetized portions of said plate, and mechanism for driving the plate, thereby carrying ore particles along the magnetic fields and centrifugally discharging non-magnetic particles from the edge of the plate at magnetic, and magnetic particles neutral portions of said plate.

686,407. BRICK-KILN.—William Joyce, Cambridge, Mass. A kiln having a main chamber, two furnaces located at one side thereof and one above the other, a flue or passage leading horizontally from the lower furnace below the floor-level of the main chamber and communicating with the lower part of said chamber, a second flue or passage leading vertically from the furnace and communicating with the upper part of the main chamber, and a removable partition separating the two furnaces.

686,427. APPARATUS FOR COMPRESSING GASES.—William T. Sugg, Westminster, England. The combination with a single base-plate having within it both ports and passages for a motor fluid and ports and passages for the gas to be compressed, of horizontally-oscillating motor-cylinders and horizontally-oscillating compressing cylinders, a crank-shaft arranged perpendicularly to said base-plate and in relation to which the said motor-cylinders and compressing-cylinders are radially arranged, and connections between the said crank-shaft and the piston-rods of said motor-cylinders and compressing-cylinders.

686,444. ROCK-DRILL.—Henry D. Crippen, New York, and George White and George S. Maxwell, Jersey City, N. J., said White and Maxwell assignors to said Crippen. The combination of a suitable support, a motor thereon sustained in a fixed position, an extension on the support provided with ways, drilling mechanism fitted on the ways, a percussion-spring, intermediate variable connec-



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tions between the motor and the drilling mechanism, to retract the drill against the force of the spring, and means feeding the drilling mechanism independently of the motor.

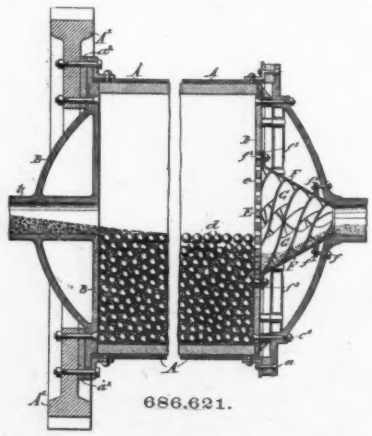
686,467. SUBAQUEOUS MINING-MACHINE.—Soren C. Monberg, Leadville, Colo. A revoluble casing comprising an outer shell, an inner shell, a spiral web connecting the outer and inner shells, pockets disposed at intervals in the spiral web, shovels at one end of the sluice-box, and a spout projecting laterally from the outer shell and adustable longitudinally thereof.

686,525. ELECTRIC FURNACE.—James H. Morley, Springfield, Mass. In an electric furnace adapted to fuse a mixture of lime and carbon to form a carbide, a source of supply for said material, a fusing-chamber, two electrodes operating therein, automatic means for supplying said material to said chamber consisting of a conveyor between said source and said chamber, adjustable means for separating said electrodes and for imparting to one of them a reciprocating rotative movement, whereby said electrode may be freed from the fused material.

686,530. APPARATUS FOR THE LIQUEFACTION OF ATMOSPHERIC AIR.—Oscar P. Ostergren, Bedford Park, N. Y., assignor to the Ostergren Manufacturing Company, a corporation of New Jersey. The combination of means for compressing air and separating the moisture deposited by compressing and cooling it, consisting of the air compressor and cooler and its moisture-trap, counter-current equalizer and its series of traps, and the expanding, cooling and power-generating engine and liquid-air separator having the counter-current plunger-piston, said compressor and cooler, equalizer and engine suitably connected for circulation of the compressed air through them respectively and for return of the waste expanded air from the engine through the equalizer.

686,551. ELECTRIC FURNACE.—Albert Simon, Bordeaux, France. An electric furnace more especially constructed for the electro-metallurgical manufacture of iron, manganese and alloys of these metals, comprising a movable crucible or hearth with raised sides, a cathode mounted on this hearth comprising horizontal carbons embedded in a layer of powdered ferromanganese and two horizontal carbon blocks resting on the carbons for the purpose of priming the furnace, an upper electrode or anode formed with vertically-movable carbons inclosed in a casing of crushed slag compressed with tar and resin, a frame in which slides the upper electrode and charging-openings provided in the frame.

686,621. TUBULAR BALL-MILL.—Povy T. Lindhard, Richmond Hill, N. Y., assignor to F. L. Smidth & Company, New York, a corporation. The combination, with a grinding-drum having an inlet, of a screen-plate in said drum having perforations below the level of the inlet,



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grinding-balls in the drum, and a discharge-cone communicating with the outlet and embracing said perforations within its base, said cone rising between its base and apex above the level of the lowermost of said perforations.

686,629. GAS-PRODUCER.—Ralph L. Morgan, Worcester, Mass., assignor of one-half to the Morgan Construction Company, Worcester, Mass., a corporation of Massachusetts. The combination with a combustion-chamber, of a pan having a bottom forming the bottom of said combustion-chamber and extending radially beyond the walls of the chamber, masonry walls supporting the outer edge of said pan and inclosing a pit beneath the center of the pan, a hub extending upwardly from the center of said pan forming a bearing for a rotating shaft, a rotating shaft journaled in said bearing and scraper-arms carried by said shaft.

686,632. APPARATUS FOR LOCATING METALS, MINERALS, ORES, ETC.—Augustus F. McClatchey, Chicago. Ill., assignor to the Electric Metal Locating Company, Chicago, Ill., a corporation of Arkansas. An induction-coil, a battery and interrupter arranged in the primary of said coil, a Wheatstone bridge arranged in the secondary of such coil, said bridge provided with earth connections, a rotable screw, a resistance-conductor arranged in the grooves of said screw and forming the artificial resistance of said Wheatstone bridge, a traveling nut mounted on said screw and provided with a contact arranged to operate over said resistance, conductor, said traveling nut being arranged in the bridging-circuit of said bidge, an indicating device also arranged in said bridging-circuit, and means for rotating said screw.

686,656. MACHINE FOR MAKING TILES.—Andrew J. Hoban, St. Paul, Minn., assignor of one-half to John P. Berchem, St. Paul, Minn. The combination with a traveling mold, of appliances for mixing and delivering a supply of tile-forming material, common actuating means for said mold and appliances, and automatically-actuated devices for supplying a quantity of water to said material before the same is delivered to the mold.

686,659. BRICK-MACHINE.—David A. Keizer, Winnipeg, Canada. The combination with an endless series of molds having compressing-dies in their lower portions, a vertical feed-shaft with spiral blades on it arranged above the mold, a preliminary packing-plunger arranged above the mold, and a horizontal actuating-shaft for said blocks having lifting-cam surfaces on the same for raising the blocks.

686,663. PROCESS OF PREPARING AN ACETYLENE PREPARATION OF MANGANESE.—Thomas Macalpine, Chiswick, England, assignor to Alcohol Syndicate, Limited, London, England. The process of preparing a manganese compound which consists in subjecting a solution or emulsion of compounds of the alkalies or alkaline earths to the action of acetylene gas and adding to the resulting product a solution containing manganese.

686,672. MANUFACTURE OF REFRACTORY MATERIALS.—Richard J. Friswell, London, England, assignor of one-half to the British Uralite Company, Limited, London, England. A process for the production of refractory materials from asbestos, chalk and like substances by depositing blocks or sheets of said substances in a solution of a silicate, and then in a solution of a bicarbonate, which latter solution is at the same time continuously brought into contact with carbonic-acid gas for the purpose of regenerating the bicarbonate.

686,691. AUTOMATIC CASING-PERFORATOR FOR DEEP WELLS.—Edwin A. Hardison, Los Angeles, Cal., assignor of one-half to Wallace L. Hardison, Los Angeles, Cal. A casing-perforator comprising a perforating-tool carrier furnished with a frictional device for engagement with the well-casing; said body being furnished with a guide, arranged to hold the perforating-tool out of operative adjustment when said tool is at its lower position and inclined upwardly toward that side of the body from which the perforating-tool is to project when in operative position and means for temporarily holding the body from sliding down the carrier when the apparatus is descending with the frictional device in contact with the well-casing.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Week Ending October 26, 1901.

17,569 of 1900. NICKEL PLATES FOR STORAGE BATTERIES.—T. Michalowsky, Cracow, Austria. Method of producing porous nickel, suitable for storage batteries.

17,993 of 1900. PURIFYING BLAST FURNACE CASES.—W. G. Crossley and J. Atkinson, Manchester. Apparatus for catching tar and dust from furnace gases to render them suitable for use in gas engines.

18,028 of 1900. PYRITIC FURNACES.—E. T. Bradford, Denver, U. S. A. Hot blast furnaces, using waste heat of the furnace for heating the blast.

19,351 of 1900. CASTING MACHINE.—J. M. Hartmann, Philadelphia, U. S. A. Casting small pigs of metal in a series of molds attached to one table, and moving consecutively under the pourer.

22,408 of 1900. PUDDLING FURNACE.—B. Talbot, Rencoyd, Pa., U. S. A. Improved puddling furnace supplied from a continuous source of refined iron.

11,832 of 1901. STEEL MAKING.—R. Dietrich, Geisweid, Germany. Making highly carbonized steel by pouring a thin stream of fluid iron into a vessel containing molten tar.

12,783 of 1901. COKE BREAKER.—D. B. de Sauvigny, Paris, France. An improved coke and coal breaker that produces a minimum of dust.

15,832 of 1901. BALL CRUSHER.—E. Ferraris, Monteponi, Sardinia. A rock crusher of rotating drum type, with internal steel balls and method of returning coarse material automatically.

PERSONAL.

Mr. C. A. Molson has returned to Salt Lake, Utah, after a visit to Mexico.

Mr. A. H. Light arrived in Salt Lake, Utah, on November 21 from Washington.

Mr. Wm. McGillivray recently returned from Dawson, N. W. T., to San Francisco, Cal.

Mr. A. C. Luck, mining engineer, is visiting New York City and will leave for San Francisco about December 15.

Mr. de Putron Gliddon, president of the International Investment Company, of Los Angeles, Cal., is on a visit to New York City.

Mr. J. R. Ogders, a mining man of Butte, Mont., has been in Victoria, B. C., investigating the mineral wealth of Vancouver Island.

Messrs. F. E. Robinson and Walter Joy who have an assay office at Salmon, Ida., contemplate doing a general mine brokerage business.

Mr. Vivian P. Strange has returned to Salt Lake, Utah, from Preston, Ida., where he went to look over some oil land for Eastern investors.

Mr. James Best, for many years cashier of the Santa Eulalia Mine, in Mexico, has accepted a position with the Balvanera Mining Company at Ocampo.

Mr. George R. Hancock has accepted the position of superintendent of the Uncle Sam Consolidated Mine at Tintic, Utah, to succeed Mr. John Roundy.

There are letters at this office for Mr. S. P. Creasinger and Mr. C. J. Bayer. These gentlemen are requested to call or send for their correspondence.

Mr. C. S. Hutchinson, of Syracuse, N. Y., left Salt Lake, Utah, on November 20, for his home after a visit to the Bluebird Copper Company's Mines in Utah.

Mr. Otto M. Rosendale, mining engineer, of Portland, Ore., was in Des Moines, Ia., last week, as expert witness in mining litigation in the Federal Courts.

Mr. F. Milton Johnson, the mining engineer, of Boston, Mass., has gone to South America to examine diamond and gold fields. He will be absent about 6 months.

Messrs. E. J. Davis and T. W. Gigson, directors of the Ontario Bureau of Mines, recently returned to Toronto from a 10 days' trip of inspection in Northern Ontario.

Prof. Henry M. Howe, professor of metallurgy at Columbia University, has been elected an honorary member of the Russian Technical Society at St. Petersburg.

Mr. J. W. Worthington, manager of the North Alabama division of the Sloss-Sheffield Steel and Iron Company's works, with headquarters in Sheffield, Ala., has resigned.

Mr. M. J. True, of Buffalo, N. Y., has been on a visit to Salt Lake, Utah, on mining business. Mr. True is the treasurer of the Bluebird Copper Company's Mines.

Prof. S. B. Christy, dean of the College of Mining at the University of California, has been elected a member of the Institute of Mining and Metallurgy of Great Britain.

Mr. Courtenay DeKalb has been appointed general manager of the Fernando Mining Company at San Fernando, Durango, Mex., to succeed Mr. James T. Mills, deceased.

Mr. J. P. Gilliam, formerly storekeeper for the Tennessee Coal, Iron and Railroad Company at Tracy City, is to engage in the mining business at Birmingham, Ala.

Asst. Prof. S. Lawrence Bigelow has been made acting director in charge of general chemistry at the University of Michigan during Professor Freer's absence in the Philippines.

Mr. William Abraham, a member of Parliament from Wales and a prominent labor leader, has been investigating industrial conditions at some of the Pennsylvania anthracite mines.

Mr. W. H. Nichols, president of the General Chemical Company, with a party of friends, left New York City last week for a trip to Mexico. The party will inspect copper mines and other properties.

Mr. James Paschall Mallette, of Chicago, Ill., passed through Salt Lake, Utah, November 21, to inspect his mining interests near Butte, Mont. He is also interested in mines at Kingston, N. Mex.

President Roland and Secretary Thomas, of the San Francisco Mining Company, San Francisco, Cal., were in Des Moines, Ia., last week as witnesses for the prosecution in the Balliet case in the Federal Courts.

Mr. S. E. Bretherton is at present in Denver, looking after the construction of a lead and copper plant ordered from the Colorado Iron Works. He recently supervised the erection of one of his hot blast plants in Arizona.

Mr. Nat Baxter, who has resigned as president of the Tennessee Coal, Iron and Railroad Company, will become president of the Cumberland Coal and Coke Company of Tennessee with headquarters in Nashville.

Mr. L. Goldsmith, mining engineer, has just returned to New York City from Maine, where he has been on professional business. He expects to leave this week to develop certain mica and graphite properties in New York State.

Dr. C. S. Porter, formerly a physician of Los Angeles, Cal., has been appointed surgeon to the Esperanza Mining Company, of Cedros Island, Lower California, and will have charge of the assaying and chemical work there.

Mr. John E. Dubois, of Dubois, Pa., who is associated with Dr. P. A. H. Franklin, in numerous mining operations in Utah, has been in Salt Lake, Utah, He visited the Yankee in Tintic and other properties in which he is interested.

Mr. Frank S. Weller, of New York City, the treasurer of the Horse-Shoe Copper Mining Company, is preparing to start on his semi-annual Western trip to the company's copper properties located near Safford, Graham County, Ariz.

Mr. R. Winters, has succeeded Mr. C. W. Gardner as general manager of the Boston & Idaho Dredge Company, operating near Warm Springs, Ida., and the latter is now manager of the Squaw Creek Mining Company, at Redding, Cal.

Mr. H. P. Taylor has resigned the superintendency of the Golden Star Mining and Milling Company, near Hailey, Idaho. Mr. Taylor intends to leave soon for the East, to arrange for the manufacture and sale of an ore concentrator patented by him.

Mr. Samuel V. Rawlings, formerly connected with the Lake Superior Iron Works, at Ripley and before that with the Lake Shore Iron Works, at Marquette, Mich., has been appointed master mechanic of the Mass Consolidated Mining Company's mines near Greenland, Mich.

Mr. Louis Pascoe, who has held a position with the Parral Milling Company for the past year, has left Parral for Pachuca, Mex., where he is interested in the Reina—a mine that has recently gone into bonanza. Major Goshits and Mr. O. W. Staples are associated with him in the property.

Mr. R. S. McDonald, formerly with the Pittsburg Coal Company, has resigned to assume charge of the bureau of mining for the United States Steel Corporation at Pittsburg, Pa. The principal duties of the new officer will be to take charge of new surveys and purchases of coal lands.

Mr. H. C. Bellinger, formerly superintendent of the Montana Ore Purchasing Company's smelters, is at Zacatecas, Mex., where he will remain some time. Before leaving Mr. Bellenger resigned his position with the Montana Company, but will be retained as consulting metallurgist. Mr. Blossom, formerly Mr. Bellenger's assistant, is now superintendent.

Mr. S. R. Trengrove, of Lake Linden, Mich., has accepted the position of general manager of the South African gold mines of the Bibiana Company, of London, Eng. Mr. Trengrove is a graduate of the Michigan College of Mines, and during the past 18 months has been the superintendent of the Holy Terror Mining Company of Keystone, S. Dak. Mr. Trengrove is to assume his new duties as general manager of the gold mines in South Africa on December 11.

Mr. Alfred Kidder, agent of the Lake Angeline Mine, at Ishpeming, Mich., has according to a local paper, retired and is succeeded by Capt. Thomas Walters, of Ishpeming. Mr. Kidder intends taking a trip to Europe and after that he will make his home in Boston where his family has lived for several years. Mr. Kidder went to Ishpeming from Boston in the early history of the iron mining region and has since been prominent in iron mining. His first work was with the initial iron ore mine of the Lake Superior district, the Jackson, where he served in the capacity of clerk and bookkeeper. In 1864 he was selected to look after the local interests of the Pittsburg & Lake Angeline Iron Company, which position he has held continuously for 37 years, up to his retirement. In 1863 he opened the Sterling Mine, and in 1874 was made agent of the Champion Iron Company. In 1875 he opened the Edwards Mine and later gave prominent attention to the Dalliba. The agency of the Champion was relinquished a few years since when the property temporarily closed down. Mr. Kidder also represented the Volunteer Iron Company for General Alger and other recent owners. Mr. Kidder was an untiring worker, an expert in the geology of the district, a hard student and close observer.

OBITUARY.

Ralph Tate, since 1876 professor of natural science in the University of Adelaide, South Australia, died recently. He was the author of numerous papers on geology and zoology and was in 1893 president of the Australasian Association for the Advancement of Science.

Walter William Palmer, who died at Greensboro, N. C., on November 20 was born in Devonshire, Eng., December 27, 1827. At the age of 20, after receiving an excellent education, Mr. Palmer came to America, and began his career as a civil engineer and miner. He had charge of the Bruce Copper Mines in the Lake Superior region. About 1856 he went to Mexico to take charge of the Veta Grande near Zacatecas. In 1860 he was invited to take charge of the Ophir Mine, on the Comstock Lode in Nevada, and thereafter spent many years upon the Pacific coast. He also visited Arizona and South America, and on visiting the Desert of Atacama in the interests of the Rothschilds contracted the disease of which he died. During the early 50's Mr. Palmer was interested in mining in North Carolina, at King's Mountain, and at the McCulloch, or North State Mine, and the Lindsay in Guilford County. Upon his health becoming affected, he left Washington, D. C., where he lived a student after his active career, and went to North Carolina, where he remained till his death. Mr. Palmer was twice married. Of a large family only 2 daughters survive. He was buried in Greene Hill Cemetery, at Greensboro, N. C.

SOCIETIES AND TECHNICAL SCHOOLS.

UNIVERSITY OF NEBRASKA.—In accordance with recommendations adopted by the board of regents last June, Prof. Michalson, as director of the School of Mining and Metallurgy, is preparing courses of study to bring about a definite relationship in the instruction bearing on mining and metallurgy given by the university.

LEHIGH UNIVERSITY.—The University is erecting a stone laboratory, 90 ft. by 43 ft. to be used in connection with the steam engineering work of the course in Mechanical Engineering. The departments of Civil Engineering and Geology at the university have recently received valuable gifts in the shape of surveying instruments, microscopes, and geological specimens for the microscopic study of rocks.

UNIVERSITY OF OREGON.—The following appointments have been recently made: Richard H. Dearborn, instructor in electric engineering; Charles W. M. Black, instructor in mathematics; Orin F. Stafford, instructor in chemistry; Percy P. Adams, assistant instructor in civil engineering; P. Irving World, assistant instructor in physics; R. R. Renshaw, assistant in chemistry.

BLACK HILLS MINING MEN'S ASSOCIATION.—This society was organized in September by men identified with mining in the Black Hills, S. Dak. Its object is to aid and promote the development of the mineral resources of the region, to establish a bureau for the dissemination of reliable information and to bring the mining men of the Hills into closer relationship. The headquarters are at Deadwood. The officers are: Harris Franklin, president; George M. Mix, S. W. Russell, and J. E. Pilcher, vice-presidents, and W. S. Elder, secretary and treasurer.

ENGINEER'S CLUB OF ST. LOUIS.—At the meeting on November 20, 30 members and 11 visitors were present.

Messrs. W. A. Layman, Wm. H. Bryan, B. H. Colby, Julius Pitzman and William Bouton were elected a committee on nominations for the ensuing year.

A letter was read from a committee on organization of the St. Louis branch of the American League for Civic Improvements requesting the Engineers' Club to co-operate in the movement by appointing a committee of five to represent the club.

The subject of the evening was a paper by Mr. Richard H. Phillips on "Quicksands." Mr. Phillips stated the character and methods of treating quicksands which he had encountered in his experience and gave the results of a number of microscopic tests, and tests for fineness. An interesting discussion followed in which Messrs. Barwick, Van Ornum, Colby, Johnson, Ferguson, Pitzman and Wall took part.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—The 44th meeting is to be held at the society's parlors, 12 West Thirty-first St., New York City, December 3-6. The annual address by President S. T. Wellman will be given on Tuesday evening, December 3, on "Early History of Open-Hearth Steel Manufacture in the United States." On Thursday evening reports will be presented from the committee to codify and standardize the methods of making engine tests and the committee on standardization of engines and dynamos. The papers scheduled for the various sessions are as follows:

"A Portable Accelerometer for Railway Testing," by F. B. Corey.

"A Bonus System of Rewarding Labor," by H. L. Gantt.

"A Silent Chain Gear," by J. O. Nixon.

"The Bursting of Small Cast Iron Fly Wheels," by C. H. Benjamin.

"A New Valve Gear for Gas, Steam and Air Engines," by E. W. Naylor.

"The Potter Mesh Separator," by F. A. Scheffler.

"Working Loads for Manila Ropes," by C. W. Hunt.

"The Heat Engine Problem," by C. H. Lucke.

"Experiments on Spiral Springs," by C. H. Benjamin and R. A. French.

"Water Power Development at Kanawha Falls," by W. C. Johnson.

"The Porro Prism," by W. R. Warner.

"Effect of Clearance on the Economy of a Small Engine," by Albert Kingsbury.

The spring meeting of 1902 will be held at Boston.

INDUSTRIAL NOTES.

The Standard Pneumatic Tool Company has removed its general offices from Chicago to Aurora, Ill., near its factories.

The Smedley Steam Pump Company, of Chicago, Ill., is figuring on the shipment of some 35 tons of pumps, etc., to Shanghai, China.

The Hatch Electric Smelting Company, Detroit, Mich., is preparing to remove its plant from Green Bay, Wis., to Newaygo, Mich., where water power can be had.

The Winifrede Coal Company, with general offices in Philadelphia and mines at Winifrede, W. Va., has ordered 2 Ottumwa box-car loaders to be delivered by December 10.

The Atlas Pipe Wrench Company, reports that a well known jobbing house in the Middle States, has placed 4 orders for quantities of Atlas pipe wrenches, in the last 40 days.

F. D. Cummer & Son Company, of Cleveland, O., has secured a contract for drying equipment which is to be shipped to the Green Island Portland Cement Company, of Shanghai, China.

The Bessemer Gas Engine Company, Grove City, Pa., is making experiments for the Maryland Steel Company, at Sparrows Point, Md., with a view of using furnace gas as a fuel for the Bessemer gas engine.

The Ottumwa Iron Works, Ottumwa, Ia., has recently taken a contract to build 2 large hoists for the Consolidation Coal Company at Buxton, Ia. These machines will be the largest in use in the Iowa coal fields.

The Armour Fertilizer Works, at Baltimore, Md., is erecting a new plant, with a capacity of 15,000 to 20,000 tons to replace the buildings recently burned. Electrical equipment is used throughout. This equipment has been purchased.

The Myles Salt Company, Ltd., of New Orleans, La., states that it is ready to contract for a salt breaker and machinery to have a capacity of 1,000 tons per day. Contractors and builders are asked to address the company at New Orleans, La.

The Carbondale Foundry and Machine Company, of Carbondale, Ill., organized to do a general repairing business and carry supplies for the coal mines in the district has erected a main building and a moulding room is about to be built.

The charcoal furnace of the Pacific Steel Company, at Irondale, Wash., is now in operation. The furnace has a capacity of 50 tons daily. The iron ore which is used in the furnace comes from the mines on Texada Island, off the coast of British Columbia.

William A. Cather, proprietor of the Bluefield Iron Works, of Bluefield, W. Va., has purchased the Franklin Iron Works, Port Carbon, Pa., and is to take possession at once. He will make a specialty of air compressors, rope haulage plants, hoisting engines and drums, mining machinery and pumps.

The rolling mills of the Alabama Tube and Iron Company, at Helena, Ala., are in operation and before the end of the year it is expected the tube department will be ready for work. This is the first tube works in the South. F. L. Clarke, formerly of Pennsylvania, is at the head of the concern.

An important decision has been rendered by Judge Wing, in the Circuit Court for the Northern District of Ohio, sustaining the validity of 2 patents on drill grinding machines owned by the Worcester Polytechnic Institute. These patents cover important devices and the decision is of great interest to manufacturers of this class of machinery and to tne trade generally.

The Stanley Electric Company, of Pittsfield, states that the long-distance power transmission companies of California, such as the Standard Electric Company, are largely using S. K. C. equipment for their plants. The Stanley Company recently received a gold medal at Buffalo for high tension alternating current apparatus.

The new plant of the Connellsville Manufacturing and Mine Supply Company, located at Greenwood, Pa., across the river from Connellsville, is fast nearing completion and the company is receiving orders for mine pumps, mine and coke works machinery and equipment. It is possible that the company will take over the business of Kenney & Co., at Scottdale, Pa.

The International Correspondence Schools, of Scranton, Pa., which started its work in October, 1891, states that up to the present time 341,500 sudents have been enrolled in the schools. The schools in postage on correspondence pay out nearly $100,000 a year. The schools employ 132 persons at Scranton, and the printing and binding plant now being erected will be one of the largest private printing plants in the world with a capacity of 2,000 400-page 6 by 9 in. volumes per day.

Work is rapidly progressing on the foundations for the new plant of the B. F. Sturtevant Company, at Hyde Park, Mass. The buildings, including storage space between, will occupy a tract measuring in extreme dimensions about 500 ft. by 700 ft. This will provide space for the foundry, pattern and pattern storage building and power plant, as well as the machine shop, 120 ft. by 500 ft., and a 3 story structure of the same length, both terminating in a large head house which will serve for the work of erecting, testing and shipping. The office will be a separate building of considerable dimensions.

The Llewellyn Iron Works, manufacturers of the new Standard concentrators, Los Angeles, Cal., has recently installed new Standard concentrators as follows: 4 at the American Girl Gold Mining Company, Ogilby, Cal.; 2 at the Consolidated Golden Trout Mining Company, Oroville, Cal.; 6 at the Hoosier Boy Mine, Prairie City, Ore.; 1 at the Mountain Chief Mine, Wickenburg, Ariz.; 2 at the Mack Consolidated Gold Mining Company, Big Oak Flats, Cal.; 2 at the Great Excelsior Mining Company, Maple Falls, Wash. The 4 shipped to the American Girl Mines are in addition to 4 already in operation.

The De Beers Consolidated Diamond Mines, Kimberley, South Africa, are, it is stated, to be equipped with some $135,000 worth of American electrical machinery for general power purposes. One contract, secured by Westinghouse, Church, Kerr & Company, of New York City, calls for 2 Westinghouse-Parsons steam turbines of 1,000-k.w. each. Another contract, calling for 2 1,000-k.w. direct-connected alternating current generators, has been awarded to the Westinghouse Electric and Manufacturing Company, Pittsburg, Pa. All this apparatus will be built at the Westinghouse Works, East Pittsburg. The contract for the turbines is said to be the first ever secured for export trade by the Westinghouse Company.

The Jones & Adams Company, of Chicago, Ill., has recently closed a lease of ground for the building or a large coal dock at West Superior, Wis., opposite Duluth. A contract has been let with the Brown Hoisting Machinery Company, of Cleveland, O., for improved steel bridges for unloading and handling coal. Contracts have also been let for conveying machinery to handle anthracite, sheds for same, and a system of pockets for storing soft coal. All of these improvements will be made this fall and winter, and the dock will be ready for operation by May 1, 1902. C. W. Adams, secretary of the Jones & Adams Company, headquarters in St. Paul, will have charge of the docks operated by this company.

TRADE CATALOGUES.

Electric heaters for a great variety of purposes, not only for domestic use, but for the laboratory and for soldering irons, solder pots and glue pots, are described in an illustrated 66-page pamphlet sent out by the Simplex Electrical Company, of Cambridgeport, Mass.

A little 24-page pamphlet published by the Edson Manufacturing Company, of Boston, Mass., describes the Edson diaphragm pump and its application to mining and prospecting work. The company makes a trench pump outfit with a capacity by one man power of 4,000 to 6,000 gal. per hour, a hydraulic thawing outfit stated to be capable of sinking an 8-in. hole through frozen ground at the rate of 3 ft. in 7 minutes, and a pile sinking apparatus for constructing wharves, coffer dam, piers, etc.

The Victor hand power rock drill for which light weight (about 100 lbs.) strength, simplicity and durability are claimed, is described in a little 12-page pamphlet issued by the Jackson Company, of Denver, Colo. The company states that the drill is adapted for sinking, drifting, stoping, and quarrying, and by replacing the ratchets can be used as a broaching drill. All gears and wearing parts are stated to be entirely inclosed from dust and mud, while the weight of the blow can be quickly altered.

Motors, dynamos and a great variety of electrical devices and supplies are described in a series of pamphlets issued by the Holtzer-Cabot Electric Company, of Boston, Mass. The company's multi-polar dynamos and motors are manufactured in sizes from 5 h. p. up. Their commercial efficiency at full load is given as 84 to 93 per cent, depending on the size of the machine. The company's type E, enclosed motors, are stated to be designed with a view to adaptibility for almost any condition or situation found in ordinary engineering practice. Where extreme lightness is desired, aluminum is used for all non-magnetic parts. The motors are made of 1-6 h. p. and upward. The company makes rotary transformers, plating dynamos, magneto-signalling apparatus, telephones, etc.

GENERAL MINING NEWS.

ARIZONA.

COCONINO COUNTY.

Grand Prize Mining Company.—This company is stated to have 65 men at work. The company is getting in machinery and supplies from Flagstaff. A 2-compartment shaft is being sunk and the smelter is reported nearly completed.

MOHAVE COUNTY.

(*From Our Special Correspondent.*)

Minnesota.—Work on this mine at Chloride, is progressing nicely, and the new 200 ton concentrating plant is nearly completed. E. T. Loy is general manager, with J. M. Russell as assistant and bookkeeper.

PIMA COUNTY.

Catalina Copper Mining Company.—This company is opening a group of 14 claims in the Santa Catalina Mountains, about 6,000 ft. above sea level. A 320-ft tunnel has cut a vein said to be 12 ft. thick at a depth of 200 ft. and a drift has been run 17.5 ft. in ore, said to average 7 to 9 per cent copper with some silver. The company is composed of Boston, Mass., men, Otis Kimball being president, and C. H. Rollin, treasurer. William Foster, of Boston, is consulting engineer. Francis Hartman, of Tucson, is resident agent.

YAVAPAI COUNTY.

(*From Our Special Correspondent.*)

Faucher.—George Faucher, owner of this mine in Signal District, has just delivered a few tons of high grade ore to the Arizona Sampling Works at Kingman for treatment. The ore is a lead carbonate, but also carries iron, gold and copper.

CALIFORNIA.

State Mining Bureau.—The field work of the Bureau is at present devoted to the quicksilver industry and to saline deposits. Assistant Tweedy is in San Luis Obispo County, investigating its cinnabar deposits, for a forthcoming bulletin. Nearly every portion of the State where quicksilver is known has been visited, and it is expected that the work of collecting the necessary data will be furnished by December 1.

Prof. G. E. Bailey is now examining every known borax deposit. His investigations in Inyo County will be principally on borax and nitrates.

Good progress is being made on the various county maps and registers which will be published as soon as the necessary data have been collected. An accurate map of the county will be made and each mine, mineral spring oil, well, or other mineral deposit indicated by number, while a general description can be obtained from the accompanying register.

State Mineralogist Aubury has sent an assistant to visit that portion of the State in which gold dredging is going on, and will investigate in detail the practical operation of the dredgers, together with the different types now in use, the cost of operation, and the extent of the industry in the State. A special bulletin will be issued on the subject when the work outlined has been finished.

Since the re-publication of the various reports and bulletins, a large demand has come from parties outside the State. A list of the publications now ready for distribution may be had on application.

As soon as the work on the various bulletins already outlined is completed, Mineralogist Aubury purposes taking up the matter of concentration, and will issue a bulletin on that subject. It will treat of the various methods used in different sections of the State.

KERN COUNTY.

(*From Our Special Correspondent.*)

The low prices of oil continue, and only those companies having contracts are producing oil in any large quantities.

The general outlook in the Kern County oil fields is much more favorable than it was during the summer, and there is much activity in the different fields. The Sunset fields since the road was completed have picked up and a number of flowing wells have been struck there. Oil which is not being shipped on contract is generally selling at from 15 to 25c. per bbl. Most of the oil not shipped is bought by the Standard Oil Company.

The shipments of oil in October were decidedly heavier than in September. The October movement

is given as follows: Kern River fields, 2,200 cars; McKittrick fields, 400 cars; Sunset fields, none; total, 2,600 cars.

Butte Mining Company.—This company at Randsburg has, according to reports, struck a large body of high grade ore running from $150 to $200. The new body lies back of the vein worked, and is a new development. McMahon is superintendent at Randsburg.

Greenback Copper Mining Company.—Out of a batch of ore sent to the Selby Smelting Works not long ago, it is said that 100 tons of copper were extracted. The company holdings are at Woody. J. A. Keith, of Bakersfield, is general manager.

King Solomon Mining Company.—This company had 50 tons of ore milled recently which realized $1,475. Forty-one tons of low grade ore shipped to the mill at Barstow netted $440. Ashford Brothers, of Randsburg, are interested.

Merton Mining & Milling Company.—This company soon will resume work on its property in the Randsburg District.

Meteor Mining Company.—This company is working at 400 feet on a 4-ft. ledge. It is low grade, but with improved machinery would pay handsomely to work. This mine is just a half mile west of Yellow Aster property. Kelly & Burcham, of Randsburg, are the owners.

Queen Oil Company.—This company's well on section 13, T 11 R 24, in the Sunset fields, still continues to spout at intervals. It is being drilled deeper. J. N. Prather is superintendent at Bakersfield.

Standard Oil Company.—This company has erected 37 tanks with a capacity of 35,000 bbls. each in the Kern fields. It is understood that contracts for erecting 100 have been let. Work on the pipe-line to tide water has not started. J. W. Miller is superintendent at Bakersfield. This company has also begun grading for the 4th addition of tanks on section 8 T, 28 R, 28 in the Kern River fields. Each addition consists of 18 tanks of a capacity of 35,000 bbl. each.

NEVADA COUNTY.

Sharp.—This mine at Canada Hill is soon to be opened up. J. T. Wirt has a bond on it and is arranging to have hoisting and pumping machinery installed. The mine will be opened by San Francisco capital.

PLACER COUNTY.

(*From Our Special Correspondent.*)

Red Bird and Buena Vista.—On these claims in Bunce Canyon, 7 miles below Colfax, rich ore has been developed. The ledge is 4 ft. wide. A shaft has been sunk and a tunnel run.

Shady Run.—The new road to this quartz mine on the American River south of Shady Run, is completed and a mill will be hauled in at once. The tunnel has been run on the ledge for 570 ft. and 6 crosscuts have been made. The ledge is said to vary from 19 to 35 ft. wide. A shaft down 212 feet connects with the main tunnel. About 2,000 tons of ore are on the dump.

SAN BERNARDINO COUNTY.

(*From Our Special Correspondent.*)

Columbia Mining and Milling Company.—This company contemplates extensive development work on its property on Providence Mountain, about 20 miles from Manvel. Among the new improvements will be a 400-ft. shaft, the contract for which has been let. The shaft is now down 300 ft. The mine has a 10-stamp mill in operation, and the ore taken out is reported high grade.

SISKIYOU COUNTY.

(*From Our Special Correspondent.*)

Myers.—At this mine all arrangements are completed for installing the 10-stamp mill. The owners claim to have a 30-ft. ledge of pay ore. The property is located on Eureka Flats, and is owned by Jesse R. Grant, W. S. Chapman, H. L. Thompson, J. A. Hennessy and L. Wetzel.

Sheba.—This old mine, at Patterson Creek, is now worked by a San Francisco company. Twenty-four men are employed. The property will be developed by tunnels and shafts, but the mill will not start up for several months.

COLORADO.

CLEAR CREEK COUNTY.

George Deep Mining and Tunnel Company.—This company has a contract for a large plant of machinery to be installed on the Kelly tunnel near Georgetown. This tunnel will penetrate Democrat Mountain for 2 miles and will cut the veins at a depth of from 500 to 2,500 ft. The tunnel is at present being driven by hand drills.

Pelican-Seven-Thirty.—This group continues to produce high grade ore, with from 20 to 30 leases on the list of regular shippers. The annual meeting of the stockholders of the Dives-Pelican Mining Company, was held in Georgetown this week.

Red Oak Company.—The concentrating mill at Georgetown has been remodeled and is now handling daily 40 tons of ore, and turns out concentrates carrying good values in lead, gold and silver. The stopes in the Sceptre Tunnel level are reported to show a continuous streak of ore, 3 to 5 ft. wide. The breast of this level is just reaching the edge of the old Tom Corwin ore shoot, which was opened from the surface years ago.

Waldorf Company.—This company has opened about 2 ft. of smelting ore in the lower level of the Commonwealth in East Argentine. The ore is said to run 50 to 60 per cent lead, 35 ounces silver and a few dollars in gold per ton. The Waldorf Company is also pushing work on the Argentine Tunnel, and the Independence, Mendham and Stevens veins.

Welch.—L. R. Fry is getting high grade ore from this mine, on Leavenworth Mountain. A mill run returned 638 oz. silver per ton and 25 per cent lead. This property produced a large amount on the early days, but was idle for several years.

DOLORES COUNTY.

Rico Mining and Milling Company.—This company recently shipped 230 tons of zinc concentrates through E. O. Jacobs & Co., of New York City, to the Vieille Montagne Zinc Company, of Antwerp, Belgium. Most of the concentrate was from the Atlantic Cable ore, which runs about 25 per cent zinc with some gold and silver. The company now treating this ore uses a magnetic concentrating process devised by Dr. H. F. Campbell, of Boston, Mass. The mill now has a capacity of 60 tons of crude ore per day. The product is divided into 3 classes, zinc, lead and iron. The zinc concentrates are now run up to 55 to 60 per cent and carry less than 4 per cent iron. The lead concentrates go above 60 per cent and carry less than 3 per cent zinc. The iron is practically free from both lead and zinc. D. H. Campbell is local manager; C. D. Hooper, at Rico, is head mill man, and Thomas Thompson is in charge of the mines.

GILPIN COUNTY.

(*From Our Special Correspondent.*)

Mining Transfers and Deeds.—A. J. Thomas to M. R. Richards one-eighth interest A. J. Thomas lode, Gregory district; J. E. Lightbourn to L. Sternberger portion of C. H. Smith placer, Russell district; T. M. Patterson to the Susquehanna Gold Mining Company, the Susquehanna lode in Enterprise district. J. J. Reilley to C. Hesselbine, Tucker lode, Quartz Valley District; Argo Mining, Draining and Tunnel Company to C. H. Carlson, K. of P. lode in Russell District; J. Guldberg, et. al., to M. Stedman, the Midland and Plover lodes, Pine District; G. W. Orear to L. A. Duffield, the Policy placer claim in Pine District; E. M. Baldwin, et. al., to National Tunnel Mining and Milling Company the Illinois, Lexington and Merrimack lodes in Lake and Russell Districts, consideration, $30,000; and a group of 14 claims and 3-4 interest in Everett lode, in Gregory and Lake Districts, consideration, $60,750; M. Dewhurst to John and Harry Dewhurst, interest in Horeshoe lode in Gregory District and in Eagle placer in Pine District; Danville Gold Mining and Milling Company to C. M. Chambers, the Skelly lode in Illinois-Central District.

Butler Consolidated Mines Company.—This company has taken hold of the Butler Mine in Eureka District and will install machinery and begin development. The shaft is down 340 ft. and both mill and smelting ores formerly taken out, were above the average grade. Richard Codman, Jr., Center City, is secretary.

Clear Creek Mining and Reduction Company.—The new 125 h. p. hoist is running and a new engine building is finished. Fifty men are at work, mostly on development account. Shipments are made daily to the Golden Smelter. F. C. Carpenter, Russell Gulch, is manager.

Town Topics Gold Mining Company.—Sinking has started at 540 ft. in the East Notaway shaft. New ore basins are being built, and the company is getting ready for heavier production. The mill ores are of good grade, the smelting ores running from $100 to $300 per ton, while some goes higher, carrying free gold. M. D. Draper, Central City, is manager.

HINSDALE COUNTY.

Ute & Ulay.—Samuel D. Nicholson and Julius Rodman, recently made the last payment on this mine. Several Colorado men are their associates. The sale was negotiated by Dr. Charles Gresswell, who was given charge of the mine 4 years ago by dispirited London owners.

The ore is said to average no more than $8 a ton in silver and gold, but by modern methods, it is a substantial producer with immense deposits. The property consists of 120 acres, and it is located near Lake City.

LAKE COUNTY—LEADVILLE.

(*From Our Special Correspondent.*)

Leadville Ore Output.—There is no change in the tonnage situation, and sulphide production is curtailed. The camp could easily produce 1,000 tons a day more sulphides if there was a market. The iron tonnage is hampered by lack of cars. The daily production is something over 2,000 tons of all classes of ores.

Leadville Manganese Production.—There is a noticeable increase in tonnage, especially from the Phoenix Company which is operating the old Sixth Street shaft, and shipping over 100 tons a day. The Colorado Fuel and Iron Company is interested.

Leadville Zinc Shipments.—Through New York brokers over 100 tons daily of zinc concentrates are being exported. The Cherokee, Kas., plant is handling 25 tons a day, treated by a special process devised by Prof. Sadtler.

A. M. W. Combination.—In all 7,500 tons of ore were shipped in October. Two new drifts are being run from the lower level of the Wolftone to open up the zinc sulphides in Mahala ground. The property could easily double its output of sulphides.

Banker Mining Company.—There is much new work at the 400 and 800 ft. levels of the Banker. A streak followed assays over 1 oz. gold and 22 oz. silver.

Bartlett.—A company of 16 miners is working this property, and is shipping good silver ore.

Benton Mining Company—Lessees are working No. 2 lode through a tunnel which has opened up a large body of $15 ore at a point in 40 ft. Shipments will begin December 1.

California Gulch Mining Company.—Most of the stock of the $5,000 necessary to complete certain developments has been sold and the probabilities are that the mine will resume work above the water level.

Consolidated Virginia.—Local people have secured a lease, and have just started work. They are after the extension of the Dinero. A good plant of machinery will be put in place at once.

Gunnison.—Lessees have opened up a good vein and are making occasional shipments of high grade silver ore.

Homestake Leasing Company.—Shipments are regular. The winze below the bottom of the tunnel level has followed the vein for over 50 ft., and it now shows 2 ft. of $100 ore.

Iron Silver Combination.—The 150 tons of ore daily come from the Moyer workings. The mill is handling a large zinc tonnage, and turning out a good zinc concentrate.

Jay Bird Combination.—In addition to work being done through the Cleveland on a gold bearing vein another set of lessees has begun operations on the zinciferous deposit which will be handled by the Leadville Concentrating Mill.

Keystone Mining Company.—Pittsburg, Pa., men head this new company which will develop the Rex Mine in Iowa Gulch, where high gold values were found by the diamond drill a few years ago. The company bought new machinery recently, and as soon as this is in place, work will resume.

Midas.—The iron shoot is growing larger, and 5,000 tons of ore netting $5 a ton were shipped in October. There is enough ore blocked out to ship at this rate for 2 years.

Nayr Mining Company.—The new strike in the White Cap Mine has developed into a fine body of lead sulphides at the 700 ft. level.

New Leadville Home Mining Company.—The monthly reports show that in the new workings of the Penrose at 650 ft. the iron ore body is over 100 ft. wide and 375 ft. long. In the Starr and Bon Air shafts the ore shoots are improving. The company is shipping 300 tons a day.

Rialto Leasing Company.—Vice-Prest. Burdett of Boston, and managing director G. L. Havens, of Denver, representing the eastern and western interests, have been settling up the old indebtedness. It is stated that the company will resume work through its deep shaft on the Pyrenes. Boston people are heavily interested.

SAN MIGUEL COUNTY.

A coroner's jury found that the management of the company had not been negligent in its provisions for safety but censured some of the minor officials for neglect of duty. The total number of victims from the fire is reported as 25.

Four Metals Mining Company.—This company is opening the Palmyra, one of its claims, on the Wattan Basin branch of Turkey Creek not far from Telluride. The upper level has reached a vertical depth of 1,000 ft., a lower level has been driven 800 ft. It shows 3 ft. of ore. Arrangements are practically completed for a concentrating plant next spring. The St. Julian, another vein, is opened by a drift 1,500 ft. long, giving 1,700 ft. of backs. From the 1,500 ft. point a 400-ft. cross-cut is being driven to open the Little Sioux vein. The company owns 6 claims. Mr. Shockley is manager.

Smuggler-Union.—Fuller details regarding the disastrous fire at this mine at Pandora near Telluride on November 20 show that the fire started from a defective flue in the tramway bunkhouse adjoining the buildings of the upper terminal of the lower tramway. There were no appliances nor facilities for extinguishing the flames which soon spread to the structure at the mouth of the Bullion tunnel by consuming the upper terminal of the lower tramway, and the lower terminal of the upper tramway. The mouth of the Bullion Tunnel was about 50 ft. from these buildings and owing to the draught through the tunnel entrance the smoke and gas from the fire were sucked into the tunnel. Many Colorado mines protect tunnel entrances against fire by iron doors, readily closed, and the Bullion Tunnel is reported to have had such protection.

Two men were sent down the Union Shaft to warn the 200 miners at work of the danger. Towald Torkelson, one of the 2 was overcome on reaching the 9th level and his companion succumbed before getting back to the Bullion Tunnel level at the Union Shaft. When smoke appeared in the workings, the men dropped their tools and made for the nearest exit. Few of those on the 7th level got away, however, for 17 bodies were later recovered on this level where 22 men had been at work. On the 9th level about 75 men were busy. The smoke was dense and pungent. In one place 12 men were overcome at the foot of a ladder they had vainly tried to climb. The density of the smoke was partly due to the burning of the converter house near the mouth of the tunnel, this building being saturated with oil.

The fire did not penetrate the mine workings and the loss of property was confined to the surface buildings. This loss is not expected to exceed $50,000, but the necessary repairs will cause the mine to be partly closed for a month or so, throwing perhaps 300 men out of work.

It is stated that there were doors at the mouth of the Bullion Tunnel; why the doors were not closed, however, remains a mystery. For one thing, the fire spread fast and soon the entrance to the tunnel was so full of smoke that no man could get there. Had provision been made for closing the doors from a distance, the worst features of the disaster, it is thought, would have been prevented. One of the burned buildings was directly over the tunnel entrance.

The main Bullion Tunnel is 2 1-2 miles long, extending from where the fire started to the Sheridan dump. Those of the men at work who struck for the Sheridan end of the tunnel got away. The funeral of the dead men occurred on Saturday, November 23. The disaster is one of the worst in the history of mining in Colorado. It appears that the company had complied with the State laws governing mining.

(*From Our Special Correspondent.*)

At the election held November 5, it was voted to issue $35,000 in county bonds for building a wagon road from Telluride through Marshall Basin to the Tomboy Mill. The road starts at the edge of Telluride, at an elevation of 9,800 ft., with the mill terminal at 12,100 ft. The direct distance between terminals is but 3 miles, but the road will be 5 1-2 miles long. The engineer's estimate of the cost is $28,980, and 2 years will be required for the work.

Ophir Consolidated.—This company in driving the No. 3 level on the Butler Lode, has opened a large free milling quartz vein, which where intersected was 20 ft. between walls, carrying some silver and lead. By far the larger part of the vein showed gold values running from $18 per ton, with a streak of hard quartz 3 to 5 in. wide, heavily charged with gold flakes and wires. The new vein is believed to be the continuation of the Ida belonging to the Butterfly-Terrible Company, an adjoining property. The present mill of the Ophir not being suited for a strictly free milling gold ore, no effort will be made at present to mine the new vein, but it will be steadily developed.

Smuggler Union.—This company has reconstructed its original stamp mill, built in 1881, and has now in operation one of the most thoroughly equipped concentration plants in Colorado, including 80 stamps of 1,050 lb. each, amalgamating plates, 24 bumping tables and 4 Wilfleys. The concentrates pass through Chili mills that regrind for 32 Frue vanners, which make the final saving. A still further saving will be made by the cyanide, expected to be ready by December 1.

TELLER COUNTY—CRIPPLE CREEK.

(*From Our Special Correspondent.*)

A decision which was handed down in the land office at Pueblo in the case of the protest of Lottie Thompson and others against the Magnet Rock Gold Mining Company, disputing the rights of the corporation to the Magnet Rock and Bulldozer lodes, dismisses the protest on the ground that the allegations are insufficient to warrant a hearing, but goes farther and rejects the application of the protestee for patent for the two lodes on account of laches.

Cripple Creek Freight Rates.—Prospects seem good for a reduction in the freight rates on ores to the mills. The Denver & Southwestern combination which controls the Florence & Cripple Creek and Midland Terminal Railroads has made a cut to $1 per ton on all ores to Colorado City and Florence. This rate is given on all ores regardless of the value, thus making a flat rate. Heretofore the rate has been governed by the value of the ore.

Anaconda Gold Mining Company.—Considerable leasing is being done on the Anaconda, and it is understood that the royalties of these lessees are paying for the development being done.

Arrow Gold Mining Company.—A statement issued by President Farnsworth, gives a review of the recent legal difficulties and explains the present financial condition. The company has been in litigation with the Orphan Bell Mining and Milling Company for about a year, but a compromise has been reached, by which the Orphan Bell Company paid $54,000, and other parties interested in this suit paid to the Arrow Gold Mining Company $4,750, making a total of $58,750. By this arrangement, the Arrow Company deeds all its property to the Orphan Bell Mining and Milling Company, thus leaving it with no real estate. From the money received it is proposed to declare a 5c. dividend, leaving money enough to pay all the company's indebtedness. The principal reasons for making the compromise with the Orphan Bell was the outlook for expensive litigation, which might last several years.

Cripple Creek Consolidated Gold Mining Company.—There is considerable activity on the Gold Hill property, where a number of leases are being worked on the Colorado Boss Nos. 1, 2 and 3 claims, and some are getting good ore close to the surface. This property joins the Anaconda and the Mary McKinney.

Doctor-Jack Pot.—The new pump is working very successfully, and development is not hindered by water. Some ore is being shipped. The property is controlled by the Woods Investment Company.

Doyle vs. Burns.—This famous mining suit is again on trial at Council Bluffs, Iowa. It involves a large amount of stock in the Portland Mine. Quite a number of well known attorneys and mining men of Colorado are at the trial.

Empire State Gold Mining Company.—The property recently owned by the Orphan Gold and the Arrow Gold Mining Company, has been transferred to this company, and consists of the Ida Bell and the Ida Bell No. 1 lodes and the Orphan and Orphan No. 1 lodes, situated on Bull Hill, adjoining the Isabella. This property originally belonged to the Orphan Bell Mining and Milling Company, and was sold some years ago to an eastern syndicate. Afterwards local men formed 2 companies, the Orphan Gold and the Arrow Gold Mining Company. For some time, litigation has been in progress in which the old Orphan Bell Company claimed the right to be allowed to buy back the property. The Empire State Gold Mining Company was organized and the largest stockholders in the Orphan Bell Company furnished the money to buy back the property. Considerable work is now being done on the south end of the properties, and it is understood that the shaft will be sunk to 900 ft. It is understood that all Orphan Bell stockholders are privileged to get into the new company on the same basis as the larger stockholders who furnished the money.

Mabel M. Gold Mining Company.—It is currently reported that a consolidation between the Mabel M. and Gold Dollar properties on Beacon Hill is pending. It is also reported that some other Beacon Hill properties may be taken in. The Gold Dollar and Mabel M. are situated on a part of the old Arequa town-site, taken up several years ago as agricultural land. The Gold Dollar Company is controlled by Tucker, Ballard & Co., and the Mabel M., by the Woods Investment Company. Considerable ore has been shipped from both.

Nellie V. Gold Mining Company.—Good reports continue to come from this property on Squaw Mountain, and it is understood that a car-load of ore will soon be shipped, which is expected to run between $300 and $400 per ton. The property has never shipped to any great extent. It is situated on Squaw Mountain, not far from the Ajax.

IDAHO.

BINGHAM COUNTY.

(*From Our Special Correspondent.*)

Hoff Dredging Company.—At Basalt, a small station on the East bank of Snake River, near Blackfort, this company has completed a large suction dredge, said to have a capacity of 5,000 cu. yd. a day. The plant is patterned after a suction dredge built by the Sweetser-Burroughs Dredging Company on Snake River near Minidoka, which has been in successful operation under the management of Geo. T. Burroughs, Jr., for the past 7 years. The new enterprise at Basalt has some rich bars to work on that are especially adapted for dredging by this method.

CUSTER COUNTY.

(*From Our Special Correspondent.*)

Hartford Copper-Gold Company.—The new 10 stamp mill is in operation, crushing about 30 tons of ore daily. The mine is looking well. The concentrates are worth from $300 to $400 per ton in gold, silver and copper, and are shipped to outside smelters.

Lucky Boy.—This mine, mill and cyanide plant at Custer City is again in full operation, giving employment to the usual force of from 75 to 80 men, and reducing 75 tons of gold ore each 24 hours. The new shaft is completed to the 5th level, and is used for hoisting from a large reserve of good ore above that level. The shaft will go to the 8th level, where much richer bodies were opened before the destruction of the old shaft. Enough ore is blocked out to last the mill at its present capacity 2 years.

Montana.—John I. Minear, superintendent of the Hartford Company, has taken a bond on this adjoining mine that has been idle several years. It was formally noted for very rich ore, and made one shipment of 75 tons, that netted over $1,000 per ton.

Thunder Mountain.—This new gold and copper district, in the roughest and most inaccessable part of Idaho, is attracing much attention, and travel via Custer and Lemhi County routes. The district has been kept before the public the past summer by the Boise papers. Opinions as to the true merits of the new district, by very competent mining men, vary; some say that it is a mountain of $5 or $6 free milling ore, and others contend that the values only occur in the seams and joints of a great dyke or overflow of rhyolite-porphyry and breccia, and that the main mass of the rock carries no value, and will not pay to handle. Interest centers in the Caswell group of claims, which have been developed to a depth of 150 ft. A deposit of $100,000 has been placed in one of the Boise banks for purchase by some Pittsburg people, headed by W. H. Dewey, formerly of Idaho. A new 10-stamp mill has been packed in, and is about ready to run. The formation of the Thunder Mountain region is principally granite and gneiss, together with local areas of crystalline metamorphic rocks, and great outbursts of acid igneous rocks, quartz-porphyry, rhyolite and trachyte. The granite is rich in fluorite and the general conditions of the region are favorable for the discovery of some valuable gold deposits.

IDAHO COUNTY.

(*From Our Special Correspondent.*)

Blue Jacket.—This mine in Crooks Corral District was sold recently to Capt. John R. Wood, of Appleton, Wis. The price was not made public. The property was owned by Morton & Johnson, and about 18 months ago, was under bond to the Idaho Exploration and Copper Company, and was again bonded to Spokane men who put on a gasoline hoist, and after considerable development abandoned work. The former owners, continued drifts and cross-cuts on the 200 and 300-ft. levels, and showed up a fine body of copper ore. There is a shaft 300 ft. deep and about 1,000 ft. of levels and cross-cuts. The vein on the 300 is reported 77 ft. wide between quartz-porphyry and diorite walls. Values are in gold, silver and copper. The mine is dry.

Grangeville Hydraulic Mining Company.—This company has been incorporated to work a placer mine on the north fork of the Clearwater River. The incorporators are W. R. & B. L. Crosby, B. C. Wiltse, of Grangeville; Charles G. Aldridge, of Juliaetta, and Joe C. Meingassner, of Summit. The capital stock is $150,000, one-half of which has been subscribed.

Iron Crown Mining and Milling Company.—This company, of Grangeville, has increased its capital stock from $500,000 to $750,000. Mrs. Sally Lanterman, of Youngstown, O., is president.

Jumbo.—This mine at Buffalo recently made a clean-up of $5,000 in bullion from a 27 days' run of its 4-stamp mill. This is the first clean-up from the 4 stamps, and work will be continued. Total production to date is $10,000, which represents 45 days for 2 stamps, and 27 days for 4 stamps. Concentrates to value of $3,900 have been shipped. Frank Brown is managing owner.

Lucky Ben—Work is progressing on this mine and the Hornet, at Warren, under the direction of James Moffatt. J. A. Czizek, of Boise, and A. W. McCune, Jr., of Salt Lake, are interested.

Silver King.—This Warren mine is being developed on the 300 level by a small crew. Ambrose Stewart is manager.

LEMHI COUNTY.

(*From Our Special Correspondent.*)

Frank Pollard, owner of the new coal mine, 2 miles west of Salmon City, recently sold 1-4 interest in the property for $5,000 cash. The mine continues to open in a satisfactory manner, and

its development is to be on a much more extensive scale. The coal is meeting with a ready market at $5 per ton.

Kittie Burton Company.—This company has purchased a 5-stamp free gold mill for its property at Indian Creek, and is now getting it to the mine.

SHOSHONE COUNTY.

During October the principal mines of the Coeur d'Alenes employed 255 men, as follows: Bunker Hill & Sullivan, 105; Empire State-Idaho (Last Chance), 41; Standard, 35; Hunter, 21; Mammoth, 19; Empire State-Idaho (Tiger-Poorman), 17; Morning, 4; Bell, 4; California, 3; Hecla, 3; Silver King, 3.

ILLINOIS.

Governor Yates, of Illinois, recently appointed the following state mine examiners to serve for 2 years: Hector McAllister, Streator, to succeed himself; Thomas Hudson, Galta, to succeed himself; Walter Rutledge, Alton, to succeed himself; John Dunlap, Centralia, to succeed himself; Evan D. Johns, Murphysboro, to succeed himself; James Taylor, Edwards, to succeed John W. Graham, Dumfermline, term expired; Thomas Weeks, Colfax, to succeed John William, Westville, term expired.

Kellyville Coal Company.—Work on the big shaft of this company near Danville, is progressing rapidly and it is expected that the shaft will be ready by January 1. Between 400 and 500 men will be employed. The capacity is expected to be from 1,500 to 1,800 tons of coal daily. The shaft will be known as Kelly No. 4, and is just east of Westville.

INDIAN TERRITORY.

Negotiations are practically consummated for the control of the Choctaw, Oklahoma & Gulf Railroad and the Chocktaw & Memphis Railroad by the Atchison, Topeka & Santa Fe Railroad. This will give the Atchison control of about 40,000 acres of valuable coal properties in Indian Territory.

KENTUCKY.

HOPKINS COUNTY.

The camp of armed miners affiliated with the United Mine Workers, near Mortonville was shaken up by Judge Hall, Adjutant-General Murray and 2 companies of State militia on November 24. Only about 27 men of 300 or more who were in the camp a few days before were found by the officers and all the arms had been removed. Most of the men and boys captured were lodged in Madisonville jail. It is thought the union miners will now give less trouble and that the coal mines will run without interference.

MICHIGAN.

COPPER—HOUGHTON COUNTY.

(*From Our Special Correspondent.*)

Calumet & Hecla.—This company owns a tract of land in Chippewa County, estimated to contain 170,000,000 ft. of standing timber. Expert estimators will be sent in this year prior to the establishment of camps. Each winter about 10,000,000 ft. of timber is cut and manufactured into lumber at the company's mill, at Whitefish Bay, and shipped by boat to Torch Lake. The company's evident policy is to hold its lands without denuding them of timber, purchasing such quantities as may be required from year to year.

Hancock & Calumet Railroad.—The change from narrow to standard gauge is made and standard gauge rolling stock is in use. The road was built in 1887 largely to handle the traffic of the Tamarack and Osceola Mines. It serves all the mines north of the Tecumseh, with the exception of the Calumet & Hecla, which has a road of its own. The change in gauge will be of great value to the mines; improving the rock service between the mines and mills and facilitating all-rail shipments of copper.

Quincy.—This company has purchased 30 narrow gauge cars from the Mineral Range Railroad Company for handling coal between the mine and mill. The Quincy & Torch Lake Railroad will be extended to the mills on Torch Lake, where a large coal dock is building. Twelve men are installing the new tram system under the direction of a representative of the General Electric Company, on the 43d and 49th levels.

Rhode Island.—No important developments have resulted from the work under way. The cross-cut east from No. 2 shaft, at the 4th level, 500 ft., is in a considerable distance, and may tap the Allouez conglomerate in February.

Tecumseh.—Men are still sinking No. 1 shaft on the Osceola amygdaloid lode. At present the shaft is down 1,425 ft., and sinking at the rate of 50 to 75 ft. per month.

COPPER—KEWEENAW COUNTY.

(*From Our Special Correspondent.*)

Phoenix.—A. H. Floeter, late assistant superintendent of the Redridge dam, and of the Atlantic and Baltic Mills, has charge of the survey of the new railroad to connect the mine and the Arnold stamp mill.

COPPER—ONTONAGON COUNTY.

(*From Our Special Correspondent.*)

Halliwell.—Work at this property, in the Porcupine Mountains has been stopped for the winter. Work during the past 6 months has been under the personal supervision of H. H. Reeves, and consisted mainly of diamond and churn drill operations. The formation seems considerably disturbed, but the Noble lode, the most important crossing the property, has been traced for over 4,000 ft. The Porcupine Mountains district contains the sedimentary division of the Keweenaw formation, and the copper is carried in sandstone, and sandstone conglomerates, usually as extremely fine particles.

IRON—MENOMINEE RANGE.

Menominee Range Shipments.—The total movement of ore this year is expected to exceed 3,600,000 tons, of which total the Chicago & Northwestern road has handled about 3,000,000 tons and the Chicago, Milwaukee & St. Paul road between 600,000 and 700,000 tons. Last season, 3,261,221 tons were shipped and in 1899 a total of 3,301,052. From the Iron Mountain the St. Paul road has handled 467,000 tons for the Chapin Company, 61,000 tons for the Antoine Ore Company, 73,000 tons from the Quinnesec Mine and about 12,000 from Groveland. The Chapin, Antoine and Quinnesec Mines have suspended shipping for the year.

MINNESOTA.

(*From Our Special Correspondent.*)

Shipments are decidedly light, while the freight rate to Lake Erie ports has advanced to $1.25 a ton. There are considerable minor tonnages of outside ore to be moved, but the United States Steel Corporation is practically through its shipments, and most of the other big shippers are about over.

Several grading contracts on the Duluth & Iron Range road are completed, and the outfits are laid up. The wood bridges on the line of the Duluth, Missabe & Northern road are all being replaced by steel girders on concrete and stone abutments.

Daily papers report most extraordinary finds of iron in localities where no iron exists. Last week they reported a large find upon the line of the Duluth, Virginia & Rainy River road, 5 miles north of the Virginia group of mines. There is nothing in it. This week they report a find of great value in sections 35 and 36 T 59 R 17. Here drillwork 8 or 9 years ago showed a banded ore of no value.

The ruling of the Minnesota railway and warehouse commission that it cannot interfere with the ore traffic of the 2 roads that begin and end in the State, as their traffic is essentially of an interstate character, is very sweeping, and ends the frequent contentions during past years that caused trouble between mines and roads, and between political parties and the roads.

IRON—MESABI RANGE.

(*From Our Special Correspondent.*)

Adams Iron Company.—This company has shipped 750,000 tons and has closed for the year. At No. 4 shaft a Westinghouse locomotive is installed underground, with 3-ton steel side dump cars. This new haulage system will be used in a few days. The motor will draw about 10 loaded cars, and the track circuit is now about half a mile long. It is expected to make a great saving in operation.

Auburn Iron Company.—This company has let an additional stripping contract to the Drake & Stratton Company, which will work there as late as possible. The mine's production this year is the largest in its history.

Fayal Iron Company.—This mine will end the season with an output a trifle short of 1,700,000 tons. The exact shipment depends upon the weather, but will not fall below 1,660,000 tons. The mine shipped last year 1,252,000 tons. The mine was opened in the winter of 1894-5, and has made a total shipment to this time of 5,500,000 gross tons. Because of the enormous shipments from this mine, the Duluth & Iron Range road will this year make a total business in the 7 1-2 months of the shipping year of more than 5,250,000 gross tons of ore, also a record breaking total.

Jeffries.—This ore deposit, lying in section 10 T. 58, R. 18, south of the Mountain Iron Mine, has been sold by the fee holders to the Belliton Mountain Iron Company, of Duluth, for $60,000, and the latter has sold to Cleveland parties for $125,000. There are 160 acres in the sale, on which about 3,000,000 tons of ore running up to 58 per cent. iron, and about .044 per cent. phosphorus have been shown. The price is considered very high. A year ago the property was refused at less than half the present price. The buyers are eastern furnace interests, who want ore badly. It is possible that they may mine shortly. The lead lies close to both the Duluth, Missabe & Northern and Eastern Minnesota roads.

Pitt Iron Company.—This company, of which E. C. Garlick, of Cleveland, O., is superintendent, is opening a mine in section 23 T 58 R 17, close to the Elba. A shaft has been sunk 100 ft, and considerable underground work has been done. Machinery is being installed, and a number of buildings erected.

Rust.—This mine, at Hibbing, is having an electric tramming equipment installed similar to that at the Biwabik, and it will be in operation as soon as the cars are ready.

Sellers.—This mine, which has been closed down for more than a year, has started again, with about 100 men at work. A large amount of ore will be got out this winter. The stock pile has been on surface for some years, has been shipped.

Swallow & Hopkins.—Ore has been found in these lands in T. 59 R. 15 by the Donora Mining (Union Steel) Company. Some other explorations of this company are not turning out as well as hoped.

MISSOURI.

JASPER COUNTY.

(*From Our Special Correspondent.*)

Joplin Ore Market.—The zinc market showed another advance during the week, and the lead ore market has been unusually strong. Some very choice zinc ore was not sold, leaving the top price unchanged, but lower grades advanced from 50c. to $1 per ton. During the week 112 tons of zinc ore were loaded for Belgian smelters. Double this amount could have been loaded had there been cars. The consignment is said to be the first of 2,500 tons which will be shipped before January 1. The Missouri & Kansas Zinc Miners' Association is the seller.

The highest price paid for zinc ore during the week was $30 per ton upon a straight bid. During the preceding week the highest price paid was $30 per ton, upon an assay basis of $26 per ton for 60 per cent ore. The highest price paid for lead ore this week is reported at $24 per 1,000 lbs for one lot only. The remainder of the product brought $23.25 per 1,000 lbs., the price paid for lead ore for the past 3 months.

During the corresponding week of last year the highest price paid for zinc ore was $29.50 per ton and lead ore brought $23 per 1,000 lbs. The outlook in the district is exceedingly bright, and much prospecting is going on.

Following is the turn-in for the week ending November 23.

	Zinc lbs.	Lead lbs.	Value.
Joplin	2,802,140	668,630	$ 54,776
Carterville	1,836,860	446,820	34,379
Galena-Empire	1,328,360	165,650	20,355
Aurora	1,150,240	36,100	13,355
Webb City	735,100	29,570	10,086
Oronogo	511,680	20,480	7,356
Carthage	572,310	....	8,012
Spurgeon	140,840	75,530	3,657
Roaring Springs	261,700	7,760	3,190
Duenweg	57,500	110,520	3,318
Cave Springs	148,400	19,480	2,458
Zincite	205,140	....	2,769
Central City	165,650	4,220	1,986
Carl Junction	208,540	....	2,920
Neck City	130,350	....	1,890
Granby	220,000	39,000	2,839
Sherwood	144,810	....	2,029
Wentworth	40,000	....	560
Total	10,673,680	1,623,760	$175,932
Total, 48 weeks	470,405,800	64,367,510	$7,185,873

Zinc value for week, $138,382; lead, $37,551; zinc value, 48 weeks, $5,708,852; lead, $1,477,021.

ST. FRANCOIS COUNTY.

Elizabeth Lead Company.—The stockholders at the annual election, chose the following directors: John D. Davis, George C. Hitchcock, F. N. Judson, J. L. Mauran, Arthur Thacher, H. G. Walker and H. A. Wheeler. The directors elected the following officers: President, H. A. Wheeler; vice-president, J. L. Mauran: secretary and treasurer, Arthur Thacher.

MONTANA.

(*From Our Special Correspondent.*)

The first meeting of the honorary commission appointed by Gov. Toole to raise funds for the State Mineral Exhibit at the Louisiana Purchase Exposition has been held in Helena. H. J. Davidson was made president and H. H. Matteson, secretary. It was the prevailing opinion that the commission ought to raise $25,000 to start the enterprise going, and to ask the next legislature for $50,000 more. The meeting adjourned to December 5.

BEAVERHEAD COUNTY.

(*From Our Special Correspondent.*)

Diamond Hill Properties.—The Scotch syndicate who purchased this property some years ago and built a 120-stamp mill that was sold last summer, is offering to sell the mines and retire from the field.

East Pacific.—R. A. Bell has returned from New York City without disposing of this property, not be-

ing impressed with the financial standing of the parties who were negotiating for it.

Greenwood Mining and Milling Company.—The concentrator and pneumatic cyanide mill of this company at Greenwood, 8 miles from Melrose, have closed for the winter. A satisfactory season's work was accomplished which was largely taken up with cyaniding experiments on tailings from the concentrator.

Red Rock Irrigation Company.—This is a new organization formed to develop power from Red Rock River to manufacture light, heat and to furnish irrigation for 30,000 acres of arid land situated in the southern part of the county.

CASCADE COUNTY.

Hartley.—Wm. Mueller, owner of this mine, at Neihart, has set about working the property extensively. He has 12 men busy and ships several cars of rich ore weekly.

FERGUS COUNTY.

Spotted Horse.—The mill connected with this mine, near Maiden, had shut down for the winter, largely owing to the poor water supply and unsatisfactory results of its operation. A large part of the miners have been discharged, but a number have been retained to prosecute certain development work during the winter. The mine has been in operation for the past year by the Central Montana Mines Company, and the mill has been running steadily for the past 4 months. The refractory nature of the ore has prevented as close an extraction as should be obtained. The time of the bond held by the Central Montana Company has been extended, pending the settlement of the Wright-Bragg controversy. The winze on the ore body will be sunk to a depth of 200 ft.

FLATHEAD COUNTY.

(*From Our Special Correspondent.*)

Kintla Lake Oil District.—A number of outfits are preparing to drive wells in this district, between Flathead Lake and Lake McDonald and eastward. Rigs are going in by way of Belton and Blackfoot Stations on the Great Northern Railroad. Operators from Pennsylvania, Texas, California and other sections are on the ground. The Kintla Lake oil has a heavy paraffine base, it is claimed, thereby differing from the Texas and Californian product.

GRANITE COUNTY.

New York & Montana Consolidated Mining and Milling Company.—The principal stockholders are J. C. Duffey, W. E. Deeney, Gust Nissem, John O'Meara and Mrs. McDonald, of Butte. The properties of the company are located in the Red Lion District and consist of 11 claims said to carry gold values. On one claim there is a 50 ft. shaft and a 150 ft. crosscut tunnel, cutting the lead at a depth of 100 ft. Considerable work has been done on the others, the Paul Kruger group having about 1,000 ft. of work.

It is the intention of the promoters to develop the ground and to complete an addition to the Red Lion Mill.

LEWIS & CLARKE COUNTY.

Columbia Gold Mining and Milling Company.—J. H. Wilson, Joseph Bosch, C. L. Fredericks, and Frank Keiser, all of Lake Linden, Mich., are interested in this company. A vein recently cut is said to average over 12 ft. for a long distance and run between $10 and $13. The new strike was made in the Golden Messenger claim.

The present mill is run by water power developed from the waters of Trout Creek; but continuing the ditch down York Gulch several hundred feet enough additional fall can be secured to create power to run 50 stamps. The present mill is a combination of stamps, concentration and cyanide. Air drills will be installed. C. L. Fredericks is manager, at York.

Buckeye.—C. J. Davis and W. Judson, of Lansing, Mich., have purchased this mine and mill, 11 miles above Rimini, at the head of Basin Creek. The property is of the estate of the late C. K. Raile. After Mr. Riale's death a lease and bond was obtained on the property by a company of Helena men, who, suspended operations after working a few months. The purchase price of the property is understood to be in the neighborhood of $50,000. The mine has been developed through a 200 ft. shaft. Practically all the workings are above the 100-ft. level, and the new owners propose to sink a new shaft at once to the 200-ft. level. The 35-ton concentrator is to be started up at once upon the second class ore on the dump.

MADISON COUNTY.

Golden Wave.—W. C. McKaskle has a lease and bond on the mine, owned by Reinoehls & Kneedler, and has cut what is thought to be an extension of the Boss Tweed lode.

Alder Gulch Consolidated Mining Company.—This company has concluded operations for the season and suspended work.

(*From Our Special Correspondent.*)

Three cars of Iowa sulphide ore is shipped weekly to the Heinze Smelter at Butte, 16 men are on the pay roll. The property is near Parrot, and is owned by H. L. Wilson and Tom Hinds, of Butte.

Craig.—This is one of the oldest patented claims in the county, but little development other than patent work has been done on it. It is near the Mayflower, and about 1 1-2 miles from Parrot, John A. Leggett has given a bond, and leased to W. B. Hamilton, of Butte. Mr. Hamilton will equip the claim with hoisting machinery and a pump. This district was organized in the early 70's as the Point of Rocks mining district. Bunches of high grade copper ore were encountered in sinking the present shaft.

Gold Hill.—At this property new hoisting machinery is to be installed to open the ore body below the level of the lower tunnel.

Mayflower.—It is claimed by parties interested, that a consolidation of this property owned by W. A. Clark, has been effected with the West Mayflower, owned by Whiteing, Alexander & Owsley. Machinery has been ordered to work the two jointly and at greater depth. The Mayflower proved to have a large body of rich shipping ore, and has been very productive to Sen. Clark, while the West Mayflower has also been a shipper. The ore is mostly gold in tellurides.

Mollie Gibson Dredge.—After a successful season's run this boat is laid up for the winter. The Chicago company that owns the outfit worked ground leased from the Conwey Dredging Company. This latter company will probably purchase the Gibson Dredge outright for next year's work.

Surprise.—This property in the Mayflower District, about 2 miles from Parrot, is worked by Hoy & Co. under a lease and bond. New machinery will be bought to sink the shaft, now 150 ft. deep, to the 250 ft. level. Regular shipments of ore are made to the Colorado Smelter.

SILVER BOW COUNTY.

Boston & Montana.—In the United States Court, before Judge Knowles, arguments were heard last week upon the application of John MacGinnis for an extension of time in the injunction suit brought by him against this company. The application also includes the appointment of a receiver. Judge Knowles granted MacGinnis and the other parties to the action an extension of time to December 23 in which to secure the testimony of the officers of the Amalgamated Copper Company. The suit is brought to restrain the Boston & Montana Company from transferring any stock of the company on its books to the Amalgamated Copper Company, and to prevent the payment of a dividend upon the stock alleged to have already been transferred. The application also asks the court to appoint a receiver to wind up the affairs of the Boston & Montana Company.

(*From Our Special Correspondent.*)

The Business Men's Association of Butte, has raised the $3,000 necessary to guarantee the meeting of the International Mining Congress to be held next year at Butte. It is intended to raise several thousand dollars in addition to entertain the delegates, and afford them facilities for inspecting the mines of Butte and vicinity and other matters of interest.

Blackhawk.—This property, southeast of Butte in the silver belt, joining the West Olive Branch on the west, is under bond to Victor Hoffman & Co., who are preparing to place machinery and sink a new shaft.

Gem.—All work has temporarily stopped, though it is understood that H. L. Frank intends to sink the 600 ft. shaft deeper this winter.

Homestake Mining Company.—This company has acquired the Sailors Dream property, including the mill situated in Browns Gulch, about 14 miles from Butte. The company intends to enlarge the mill by adding 10 stamps for the consolidated properties.

Metz.—This claim has been put into a company called the Butte & Arizona Mining Company. A rich vein of gold ore, specimens of which showing free gold in profusion in a matrix of gangue quartz are on exhibition.

Mountain Lion.—Mott & Co., who acquired the bond from the former holders, Messrs. Pat. Mullins & Co., are running an upraise from the tunnel to the surface for air from the tunnel.

Ticon.—This property north of the Speculator, owned by James A. Murray, is to be systematically developed by Mr. Murray. Preparations to sink to a great depth, if necessary, are under way, Mr. Murray stating that he should sink to the 150 ft. level.

NEW MEXICO.

COLFAX COUNTY.

Ohio Gold Mining Company.—This company will erect a 50-ton pneumatic plant on its property at Elizabethtown. C. E. Fuller, of Denver, Colo., is planning the mill.

GRANT COUNTY.

Lordsburg Smelter.—Work is progressing rapidly on the new smelter at Lordsburg. The 3 smokestacks are up. There are 2 cupolas, either or both of which can be used for lead or copper. The smelter will be blown in soon. Ore bins are being built.

Las Animas Gold-Copper Mining Company.—This company will increase its force on the Wicks Mine, near Hillsboro. Work on the mine has resumed.

Marion.—J. J. Blow & Co. are working this mine, in the Caballos Mountains. The tunnel is now in 600 ft. with about a 3 ft. lead of copper ore in the face. Two car-loads of ore per month are being shipped. The ore averages 23 per cent copper. A new gasoline blower has been put up. Eight men are employed.

Mountain Key.—The new pumping plant for this mine, at Pinos Altos has been received and will be immediately installed.

Virginia.—Thompson & Copp have increased their force of men on this mine in the Burro Mountains. The main shaft is down 110 ft.

Volcano.—John Rutherford is putting in a pipe line at Stein's Pass to pump water from a depth of 700 ft. to this mine, in which high grade chloride of silver has been uncovered.

SANTA FE COUNTY.

Albemarle.—C. F. Easly recently received a patent for this group in Cochiti District, consisting of the Albemarle, Huron, Ontario and Pamlico claims. The patent is to Henry Woods, Mrs. Rose Leonard, Chas. H. Toll and Thomas Lowthian, who have sold their rights to the Cochiti Gold Mining Company, of Boston, Mass. Application for patent had been pending 4 years, the difficulty being over a conflict of surveys of the Canada de Cochiti Grant and the Cochiti mining district.

NEW YORK.

ST. LAWRENCE COUNTY.

Rossie Iron Ore Company.—This company is shipping about 100 tons of iron ore daily from the old Caledonia Mines at Sprague ville and contemplates sinking a new incline and opening other pits. A large air compressor, weighing 25 tons has been set up.

NORTH CAROLINA.

CHATHAM COUNTY.

Cumnock Coal Mine Company.—This company, which several months before had transferred its property to the Chatham Coal and Iron Company, recently applied to Judge Purnell at Raleigh for an order to restrain the latter from selling any bonds, alleging that it had sold some and had used the money to meet current expenses and not in paying off a mortgage debt. The matter has now been adjusted and the injunction dissolved at the request of the applicants, who are Philadelphians.

OREGON.

GRANT COUNTY.

Maryland Oregon Mining Company.—This company incorporated at Dover, Del., has a capital stock of $1,000,000. The incorporators are Judge Levi D. Travers, James Higgins and James C. Johnson, of Cambridge, Md. The directors are Levi D. Travers, of Taylor's Island; Benjamin J. Linthicum, of Church Creek, Md., Thomas B. Travers, of Cornersville, Md., James Higgins, James C. Johnson, William H. Medford, James C. Leonard, Noah Webster, Ivy L. Leonard, Levi B. Phillips, Edgar M. Skinner and William P. Beckwith, of Cambridge; James A. Higgins, of Vienna, Md., J. H. Edmonds, of Washington, D. C.; John W. Woodland and William D. Allen, of Baltimore, and W. H. Hamilton, of Oregon. Levi D. Travers is president, James Higgins, secretary, and James C. Johnson, treasurer. The company owns 12 claims.

JACKSON COUNTY.

Gold Chloride.—This mine, located on Ward Creek 6 miles from Gold Hill has been sold to Seattle men for $17,000. The property was purchased recently by Messrs. Mears, Landreth and associates.

PENNSYLVANIA.

ANTHRACITE COAL.

Delaware, Lackawanna & Western Coal Company.—The new steam plant in Keyser Valley, which will supply various collieries with steam power is expected to be in working order by January 1. The other plant is located at the Dodge Mine and will supply the collieries, washeries and fan houses of the company in that vicinity. The plant at the Dodge displaces about 30 boilers. It consists of 5 batteries, or 10 boilers, and is provided with forced draft. The Keyser Valley supply station is located at the Hampton Mine. It consists of 15 Babcock & Wilcox boilers, provided with a fuel economizer, automatic self-feeding stokers and a set of conveyors to carry away the ashes. It will also have forced or slow drafts. The capacity will be 5,000 h. p. and 1 or 2 men will be able to do the work, where 12 were formerly employed.

East Lehigh.—This colliery, south of Tamaqua, operated by the Shepp Estate, is undergoing a number

of improvements. The pockets are being enlarged and the interior renovated.

Elk Hill Coal and Iron Company.—Richmond No. 3 Colliery, at Scranton, has resumed after an idleness of 2 weeks due to a strike because some miners had no working cards.

Philadelphia & Reading Coal and Iron Company.—This company makes the following statement for October and the four months of its fiscal year from July 1 to October 31:

	October.	Four mos.
Earnings	$3,165,133	$9,786,835
Expenses	2,712,119	8,852,354
Net	$ 453,014	$ 934,481

For the four months there was an increase of $1,490,639 in earnings; an increase of $812,369 in expenses, and a resulting gain of $678,270 in net earnings.

Stevens.—Eight men were horribly burned in this mine at West Pittston last week, through the carelessness of one of their number.

Susquehanna Coal Company.—A fire in the No. 6 Colliery at Glen Lyon last week threatened the lives of 400 men for a time. All were taken out safely, except 2, who were fatally burned and 3 others, who were overcome by the smoke but will recover.

SOUTH DAKOTA.

CUSTER COUNTY.

(*From Our Special Correspondent.*)

Copper Butte Mining Company.—The diamond drill hole in this company's property on Spring Creek, 11 miles northwest of Custer, is down 100 ft. New York, Chicago and Minneapolis people are interested.

Crown.—F. C. N. Graydon, of Custer, has recently installed at this mica mine electric drills, and a new shaft is being sunk, now 100 ft. deep.

North Star Mining Company.—This company is preparing to sink its North Star shaft 200 ft. From the 300-ft level a drift run east 287 ft. cut a vein 2 ft. wide. The ore is said to run about $40 per ton gold. Omaha capital is developing the property. H. D. Lemon, of Custer, is superintendent.

University Company.—Cross-cutting has started at the 100-ft. level of this company's ground on Spring Creek.

Wabash Mining Company.—This company is working 24 men on a property in the Penobscot district, 12 miles northwest of Custer. Buildings have been erected, and a hoisting plant is being installed. The vein is 12 ft. wide and carries good values. J. F. Sidney, of Custer, is general manager.

LAWRENCE COUNTY.

(*From Our Special Correspondent.*)

Black Hills Belt Development Company.—Cross-cutting has started at the 700 ft. level on this property adjoining the Homestake Mine on the south. Indications of ore have appeared. The company is building a long flume on Castle and Rapid Creeks near Nahant for a mill.

Gilt Edge.—A new shoot of ore has been uncovered in the Gilt Edge property in Strawberry Gulch. The mine is owned by the Specie Payment Company, of Minneapolis and St. Paul. W. D. Lowry, of Minneapolis, and Senator Moses E. Clapp and W. C. Reed, of St. Paul, are the principal stockholders.

Highland Chief.—It is expected that the new cyanide plant in Spruce Gulch will start immediately. There is a 20-stamp mill with cyanide annex, capacity about 80 tons per day. Kansas City men own the property.

Pluma.—A double drum hoist, a pump and compressor have been ordered. The shaft is down 140 ft., and in the Monitor ledge. Alfred Filion is superintendent.

Shawmut Mining Company.—It is expected that this Boston company will make the final payments on the Esmeralda Mine in the Blacktail District, and resume work. The company built a 50-ton cyanide annex to a mill. The ore is a low grade cement. The mine is owned by Emil Faust, of Lead, and W. L. Faust, of Deadwood.

PENNINGTON COUNTY.

(*From Our Special Correspondent.*)

Castle Creek Mining Company.—This company, organized by W. R. McKee and Sidney Smith, of Pennsylvania and O. U. Pryce, of Deadwood, is to operate a property on Castle Creek, 5 miles southwest of Rochford. The capitalization is 5,000,000 shares, par value $1. This ground is said to show several large veins of free milling and concentrating ore.

Lulu.—Minneapolis people have bonded this mine, east of Hill City, and development is in progress.

Standby.—A new air compressor has been purchased by the Ajax Mining Company for this mine, at Rochford. The owners are J. D. C. Rumsey and associates of New York City; V. T. Price, of Rapid City, and J. B. Baker, of Lead. It is the intention to enlarge the capacity of the power plant. Water is now used for generating 125 h. p. The vein of ore is reported 100 ft. wide and over 1,000 ft. long, and said to average $5 in gold per ton. Extensive tests have been made recently.

York Mining Company—A group of claims on Friday Gulch has been purchased by Chicago people, and the above company organized. There is said to be a strong vein of rich free milling ore.

UTAH.

(*From Our Special Correspondent.*)

Bullion Statements.—The settlements at Salt Lake for the week ending November 23 are: Bullion, gold bars and cyanides, $137,200.

BEAVER COUNTY.

(*From Our Special Correspondent.*)

Cullen & Ryan Group.—Patrick McNamara, representing some Pennsylvania Railway parties, has taken an option on this group of claims near Milford and has gone east to consult with friends in regard to development.

Horn Silver.—This mine shipped 246,300 lbs. first class ore to the smelters in Salt Lake Valley for the week ending November 23.

Majestic Company.—The O. K. mine forwarded 5 cars of first class copper ore to the Salt Lake Valley smelters for the week ending November 23.

BOX ELDER COUNTY.

(*From Our Special Correspondent.*)

Century.—This mine in Park Valley shows a vein said to average 4 1-2 ft. wide that has been opened along its strike 650 ft., and has been encountered in the long tunnel 400 ft. below the surface. The mine is producing 40 tons daily of soft granular quartz carrying $10 in gold, 70 per cent of which is saved on the plates and 22 per cent over Wilfley tables. The Williams hydraulic sizer is used for classification. The tailings, it is said, only show 80c.; the mill is not yet running at its full capacity of 60 tons daily due to a scarcity of water. There are 35 men busy in the mine and mill. Percy Williams is general superintendent. Frank Jardine, Jr., mine superintendent, and Charles W. Blethen, mill superintendent

Planet.—This property, 3 miles east of the Century, on the same mineral belt has a larger acreage than any other company in the district. The Alice shaft is down 180 ft. in $11 quartz with some 600 ft. of levels driven on the vein. A tunnel is being run to cut this vein at depth. Three other tunnels are also being run to tap gold ledges on the Rose River and Mammoth claims. Percy Williams is superintendent.

JUAB COUNTY.

(*From Our Special Correspondent.*)

Tintic Shipments.—The mines that shipped ore to the Salt Lake Valley smelters for the week ending November 23, are: Ajax, 1; Alaska, 6; Carisa, 6; Gemini, 11; Eureka Hill, 6; Godiva, 2; Grand Central, 9; Lower Mammoth, 4; Mammoth, 13; May Day, 3; South Swansea, 4; Tesora, 2; Victor, 3; Yankee Consolidated, 3. Total, 73. The Tesora Mill shipped 3 cars of concentrates.

PIUTE COUNTY.

(*From Our Special Correspondent.*)

Bluebird.—This mine adjoining the Annie Laurie, is making regular shipments to the Salt Lake Valley smelters.

June Bug.—The ledge on this Fish Creek property is 6 ft. wide and was cut within 25 ft. of surface. It carries high values in gold and silver, James Long, Jr., is the owner.

Park Gold Mining Company.—This mine on Mt. Baldy is looking well. The ore recently cut is said to show gold and silver streaks assaying as high as 6 oz. in gold and 260 oz. in silver. F. J. Gibbs is superintendent.

SALT LAKE COUNTY.

(*From Our Special Correspondent.*)

Bingham Shipments.—The following shipments were made for the week ending November 23: Acme ore, 134,940 lbs.; Last Chance, ore, 47,160 lbs.; Bully Boy, ore, 25,900 lbs.; Zelnora, ore, 89,300 lbs.; Ben Butler, ore, 99,350 lbs.; Red Wing, ore, 44,500 lbs.; United States, ore, 31,800 lbs.

Bingham Consolidated Mining and Smelting Company.—This company shipped 275 tons matte from its Salt Lake Valley Smelter for the week ending November 23; 65 tons going to the Utah Consolidated Companies Smelter, and 210 tons to the Butte & Boston Company's smelter in Montana. Improvements are being pushed and increased tonnage is looked for shortly.

SUMMIT COUNTY.

(*From Our Special Correspondent.*)

Park City Shipments.—The following are the shipments for the week ending November 23d: Daly West, ore, 489,600 lbs.; Daly, ore, 248,950 lbs.; Quincy, ore, 644,170 lbs.; Ontario, ore, 1,591,660 lbs.; Silver King, ore and concentrates, 1,281,620 lbs.; Anchor, concentrates, 429,500 lbs.; California, concentrates, 121,850 lbs.

California.—This mine is shipping ore from the copper vein that was opened up a few weeks ago.

Daly.—The miners on the 800 level of this Park City mine have been moved to the surface tunnel. A drift is being driven towards the Quincy ground.

Daly Judge.—The buildings are all finished on this company's ground on Bonanza Flat. The hoisting and pumping machinery is being installed.

D. & M.—This property in Thaynes Cañon is showing up well. The tunnel is in 430 ft., with the face becoming more mineralized.

Golden King.—This property in Snake Creek mining district south of Park City is looking well. M. R. Evans, who is managing the property says the ledge is 5 ft. wide with streaks running very high in gold and silver.

Little Bell.—The shaft near Park City is down 200 ft. and everything is looking satisfactory.

Park City Zinc Mill.—Messrs, Mayne & Leonard have begun work with the new zinc plant on the site of the old Peck concentrator. The Anchor is now the largest producer at present. The process is first concentration; then the product is roasted, making the iron magnetic. A magnetic separator eliminates the iron and the product is ready for shipment east. Mr. Mayne has been at Joplin, Mo., where he is interested in mining and Mr. Leonard is interested in several Utah camps.

Ramshorn.—A contract has been let in Park City for 100 ft. of work on this property near the Valeo.

Steamboat.—This claim is closed down for the winter.

St. Louis and Vassar.—These claims between the Wolverine and Southern Tier mines in Snake Creek district, have been bonded to H. Coleman and others for $25,000. Buildings are to be erected and work prosecuted during the existence of the 2 years' bond.

Wabash.—This Park City company owns 7 patented claims in the heart of the Ontario holdings and is sinking a double compartment shaft. Buildings are going up and machinery has been ordered.

Wide West.—There are 3 ft. of ore reported exposed in this claim in the Snake Creek mining district.

TOOELE COUNTY.

(*From Our Special Correspondent.*)

Stockton Shipments.—The following are the shipments for the week ending November 23: Ophir Hill, concentrates, 1,198,800 lbs.; Utah Queen, ores, 47,480 lbs.; Hidden Treasure, ore, 70,680 lbs.

Honorine.—The owners of this property at Stockton are excavating for a shaft house and will sink a 3-compartment shaft 650 ft. They have ordered a $15,000 Rand compressor and will install 3 300-h. p. boilers. Up to the time of closing down a few weeks ago, the company had much trouble from water.

Sacramento.—The cyanide mill at Mercur was destroyed by fire on November 21. The plant was insured for $15,000, but this amount will not cover the loss. The management may rebuild the mill with improvements. The property although working continuously up to the present has not paid any dividends for many months.

Utah.—This mine at Fish Springs has sent to the Salt Lake Valley smelters 41,940 lbs. of first class lead and silver ore. The mine is looking well

WASHINGTON COUNTY.

St. George Copper Company.—Grant Snyder, manager of this company's Dixie Mine, recently placed an order for a new 60 h. p. gasoline hoist, to replace the one now in use. The shaft is now down about 550 ft. below the tunnel level and the intention is to sink to 1,000 ft. without delay. Levels will be run out at intervals and by spring everything will be in shape for a much heavier tonnage.

WASHINGTON.

FERRY COUNTY—REPUBLIC.

(*From Our Special Correspondent.*)

Hawkeye.—The shaft is down 175 ft. and the bottom in good shipping ore, principally silver and copper.

Lone Pine-Surprise.—The main working tunnel on the Lone Pine is in 375 ft. At 357 ft. a cross-cut shows the Lone Pine No. 2 vein 10 ft. wide, clean quartz. Four feet of this assayed $16 and the other 9 ft. $9 per ton. In driving the last 37 ft., the samples averaged about $16 per ton.

Trade Dollar.—The cross-cut from the shaft on the 200 ft. is in east 36 ft., intersecting quartz 4 ft. wide, showing $9 to $14 per ton.

OKANOGAN COUNTY.

(*From Our Special Correspondent.*)

Bodie Gold Mining Company.—At the annual meeting at Spokane, the superintendent reported 1,000 tons of ore, worth $50 per ton, on the dump. The

average of all the ore shipped to the smelter was $53 per ton, and the net average was $27.66.

Wauconda Gold Mining Company.—At the annual meeting held in Seattle on November 12, it was decided to establish the executive office of the company in Minneapolis, Minn., leaving the general office in Seattle. The following Board of Trustees was chosen: John B. Rossman, E. J. Edwards, Alexander Campbell, Jos. J. Windle and Arthur J. Edwards, of Minneapolis and Wm. Chapman, J. B. Chapman, H. Loew and C. E. Lawson, of Seattle. The trustees elected the following officers: Edward J. Edwards, president; William Chapman, vice-president; Joseph B. Chapman, secretary; Arthur J. Edwards, assistant secretary; Joseph J. Windle, treasurer.

SNOHOMISH COUNTY.

Puget Sound Reduction Company.—This company has been incorporated under Washington law with Everett as its place of business. The capital stock is $900,000. The trustees are John W. Rockefeller, F. T. Gates, E. J. Barney, C. W. Harkness, W. C. Butler, G. D. Rogers, and E. V. Carey. Up to the present time the company has been a West Virginia corporation.

WEST VIRGINIA.

MARSHALL COUNTY.

Hitchman Coal Company.—This company, of Benwood, has placed contracts for all machinery for the development of its coal property along the Ohio River near Benwood. The contract for 2 coaling stations was awarded to the Van Dorn Iron Works, of Cleveland, O., while the Wagner-Palmer Company, of Fairmount, was awarded the contract for coaling apparatus. The Monongahela Manufacturing Company, of Monongahela City, Pa., was awarded the contract for the hoisting machinery and the Jeffrey Manufacturing Company, of Columbus, O., will install the electric mining machinery.

MERCER COUNTY.

Baby Mine Disaster.—The fire in the Baby Mine of the Pocahontas Collieries Company near Bluefield, which last week was supposed under control is now raging fiercely. The only way of extinguishing the fire that seems likely to prove successful is by flooding and as the mine is opened by drifts, such action would be very costly. On Friday morning, November 22, a party of 8 prominent mining men entered the workings to determine if possible the seat of the fire and the extent of the damage. The party comprised A. S. Hurst, chief inspector of the company's mines; Robert Odhan, sub-inspector; Frazier G. Bell, mining engineer; Walter O'Malley, superintendent of mines; Joseph Cardwell, superintendent of the Shamokin Coal and Coke Company; Mr. Rice, State mine inspector; R. E. St. Clair, second assistant inspector, and Maurice St. Clair, sub-inspector. The party did not return, and on the following day a rescuing party found the bodies of all 8 men near the Tug River entrance of the mine 5 miles from where they entered. The men were probably suffocated by white-damp.

WYOMING.

CARBON COUNTY.

Ferris-Haggerty.—A contract has been secured for a quantity of ore from this mine at Battle Lake to be treated at the Grand Encampment Smelter. The Encampment Improvement and Transportation Company will haul the ore over the snow. The transportation company also has secured a contract for hauling a large quantity of the high grade copper ore from the Doane-Rambler Mine to Walcott. This ore is said to run about 50 per cent in copper and is too rich to handle profitably at the copper matte smelter. From 10 to 15 four-horse teams will be engaged all winter in hauling the ore from the Ferris-Haggerty and Doane mines.

CROOK COUNTY.

(From Our Special Correspondent.)

Butte Crude Petroleum Company.—Owing to the impossibility of getting casing, work on the first well being drilled, has stopped for the time being. The well is 650 ft. deep.

UINTA COUNTY.

(From Our Special Correspondent.)

Oil Discovery.—At 570 ft. oil has been encountered. The flow is reported 10 to 15 bbls. of a fine, light oil. The well is about 3 miles from a station called Fossil, on the Oregon Short Line Railway, and is a few miles west of Kemmerer. This oil field is about midway between Granger, Wyo., and Pocatello, Ida.

FOREIGN MINING NEWS.

CANADA.

BRITISH COLUMBIA—LARDEAU DISTRICT.

(From Our Special Correspondent.)

Black Warrior.—This group has been bonded by Dr. D. A. Stewart and N. B. Webber, of Winona, Minn. The amount of the bond is $60,000 on a working basis, Charles N. Coursier, the vendor, retaining an interest in the property.

Golden Crown.—This mine in Wellington camp has resumed operations with a small force of men. The property is one of the first shippers in that camp and has sent out to date 2,500 tons of first grade ore. The old company, has been reorganized on an assessible basis.

BRITISH COLUMBIA—SLOCAN DISTRICT.

Rockland.—A company with a capitalization of $2,000,000 has been organized to work this mine on Red Mountain. It is a gold-copper property, and it is the intention of the company to erect a smelter.

BRITISH COLUMBIA—NELSON DISTRICT.

(From Our Special Correspondent.)

Athabasca.—Negotiations between the Athabasca and Venus shareholders are still pending, and there appears to be no probability of an immediate settlement. C. B. Murray, of Toronto, representing the Canadian shareholders, and Mr. Paull, representing the English shareholders, have been in Nelson.

Payne Mining Company.—This company has purchased the Lanark Mill which was put in at Laurie several years ago. Folliet & McMillan have the contract to move and erect the machinery. Power will be furnished by a flume from Payne Creek; about 150 h. p. will be developed. Dynamos will be put in to supply power and light for the mine and to light the mill.

Union Jack.—Paul Victor Loth, of Cincinnati, O., has taken a bond on this claim on Porcupine Creek and the Wilcox Mine on Wild Horse Creek, Ymir District. A force of men will work on each during the winter.

ONTARIO—HASTINGS COUNTY.

Cook.—At this mine near Deloro work is proceeding. The 5-stamp mill has been overhauled and is running. It will be for test purposes and will run throughout the winter, when, if the results have proven satisfactory, a modern mill will be erected.

ONTARIO—MANITOU DISTRICT.

Porcupine.—This silver mine, near the old Beaver and Badger mines during the greater part of the summer has been developed under the direction of F. N. Gibbs, one of the owners, of Port Arthur. He put in a steam plant, some of it new and some of it from the Badger Mine. The mine produces native silver. By next spring a large dump will have been accumulated and Mr. Gibbs intends to erect a modern 20-stamp mill.

MEXICO.

CHIHUAHUA.

(From an Occasional Correspondent.)

Guggenheim Exploration Company.—The 450-ton mill at the Mina Tecolotes, near Parral is to be operated by power furnished by the Loomis-Pettibone producer gas system, with direct connected gas engines and dynamos. The company is substituting 2-belt driven air compressors for those now in use. There is at present but one other producer gas plant in the Republic, that at the Nacosari Mines in Sonora.

La Luz.—This mine, the property of J. F. Flynn, has contracted for a 25 h. p. electric hoist. The property is a continuation of the Palmillo vein, and produces similar ore. Power for the hoist is furnished from Parral, a distance of about 3 miles.

Las Adargas Mining Company.—This company organized under the laws of New York, with a capitalization of $1,000, will work the lead-silver-gold property near Jimenez, belonging to Adolfo Broniman. Mr. Broniman has shipped a little over 9,000 tons of ore from this property during the past 3 years, the gross value being about $200,000. His shipments averaged 5 oz. of silver; 0.46 oz. of gold, 17 per cent to 18 per cent iron, 3 per cent lime, 23 per cent silica, and 5 per cent zinc, making a fluxing ore esteemed by smelters. The shipments for August amounted to 624 tons; in September to 512 tons, October approximately 600 tons. At present time shipments are about 30 tons daily, the ore netting $40 a ton at smelter. The mine has struck bonanza at water level, 240 ft.

Los Muertos.—The new mill being erected by Angel Garcia on this property near Parral, is ready for machinery. The capacity of the mill is to be 150 tons, using a lixiviation process.

Nogal.—This Parral mine, owned and operated by English capital, has opened a body of high grade ore.

Palmillo.—Pedro Alvarado, owner and operator of this bonanza mine at Parral, has appointed Atwood Benton as surface superintendent. The machinery is daily expected for a 100 h. p., 2-drum hoist, driven by a variable speed electric motor. The mine is said to have netted its owner in the past year over $1,500,000, the ore running high in both gold and silver. A new 6 by 14 in. 2-compartment shaft is being sunk, and with its completion, and the installation of new machinery, the output will be more than doubled.

Prieta.—It is reported that this mine, near Parral, owned and operated by a Baltimore company, has contracted for a 6-drill compressor, and is to do considerable development.

SAN LUIS POTOSI.

The government will, it is stated, appropriate $100,000 out of the general fund of the State for the establishment of smelting works at Matehuala.

SONORA.

Guazapares Mining and Milling Company.—This company is starting the construction of its mill at Zapote.

Palmarejo & Mexican Gold Fields.—T. H. Oxnam, manager, is overhauling the plant at Zapote and is about to change the method of ore treatment.

Ramos.—J. H. Furman and S. G. Burn have bought these Zapote mines for an English company represented by them. The mines include the El Durango, Tetamoa and the San Augustine groups.

Tucabe.—Bonney & Johnson, owners of this mine, near the San Miguel River, 50 miles east of Magdalena are erecting a 5-stamp mill.

LOWER CALIFORNIA.

Emerald Mining and Smelting Company.—W. R. Ramsdell, of San Diego, Cal., is manager of this company, operating copper mines at Santa Catrina. The company will load vessels at Santa Catrina with copper ore by a cable which means, it is thought, from 200 to 300 tons of ore can be put on board a vessel in one day. For over a year the company has been at work developing its mines and now has about 150 men employed. A tramroad is being built from the mines to the coast. As soon as the preliminary work is completed the company expects to ship at least 2,000 tons of ore a month to smelting works at San Francisco.

MINING STOCKS.

Complete quotations will be found on pages 742 and 743 of mining stocks listed and dealt in at:

Boston.	Salt Lake City.	Toronto.
Colo. Springs.	Spokane.	Mexico.
New York.	St. Louis.	Paris.
Philadelphia.	London.	
San Francisco.	Montreal.	

New York. Nov. 29.

Amalgamated Copper was the sensation of this week, its price dropping to the lowest level this year—$78. Reports of anti-trust proceedings against the company, and the perpetual law suits in Montana, all tended to weaken the stock. It is now believed that a still further reduction is evident, as many holders of the stock have become apprehensive. In fact, the selling in the last few days may be classed among the heaviest on record. On Monday and Tuesday alone there were sold 297,535 shares, which is fully 19 per cent of the total capital stock. Only six months ago the stock brought $130, and predictions were then made that it would go much higher. Instead, it has steadily declined, and at Tuesday's lowest ($78) it has dropped just 40 per cent in 6 months, which is a record unequalled probably in high-class industrial speculation.

Anaconda, a subsidiary concern of Amalgamated, does not attract equal attention as its revenue is from the direct operation of a mine, while the parent company pays dividends from the earnings on stock which it holds in the various corporations. Consequently the fluctuations in the price of Anaconda shares are not as wide as those of Amalgamated. On the two days' showing the heaviest trading in Amalgamated, less than 10,000 shares of Anaconda sold at $34 1-4@$32 3-4.

Curb coppers were sympathetically weak, Union, of North Carolina selling down to $5 1-2, British Columbia to $12 1-2, and White Knob, of Idaho to $21 1-2.

Colorado shares are without demand and lower, with few exceptions.

In California shares Standard Consolidated sold at $3.90. A little has been done in the Quicksilver shares, the common bringing $4.35, and the preferred $9.75.

Ontario Silver, of Utah, had buyers at $10@$10.50, but not much stock changed hands.

In the Comstock group prices fluctuated uninterestingly. Sales of Consolidated California & Virginia are noted at $1.70; of Ophir at 80c., and Hale & Norcross at 20c.

Boston. Nov. 26.

(From Our Special Correspondent.)

There has been a general hardening tendency to copper shares the past week and had it not been for the Amalgamated episode, no doubt Boston would have enjoyed a fair market in these shares. The strength and animation has been mainly in the so-called South Range group, which includes Copper Range, Baltic and Tri-Mountain. The plan of consolidation of these mines, which has been contemplated for the last six months, is promised this week and will probably be different from any of the published forecasts, mainly in capitalization. The promoters, Messrs. Burrage, Lawson and President Paine of the Copper Range, have been awaiting a favorable opportunity, market-wise, for launching the scheme.

The action of the Amalgamated in the market has caused rumors of all kinds to spread about, but nothing authoritative can be obtained relative to the plans of the management. Rumors were rife to-day that the Lawson block of stock was to be gunned for and in one quarter it was reported that he had settled for $75 per share by accepting this price for his holdings. This is rumor and must be taken for what it is worth. The present decline has carried the price down 6 points below the level reached immediately after the dividend was reduced and has caused rumors and reports of widely varying character.

At present there seems little likelihood of a cut in the price of copper and it is hard to believe that the dividend will be cut still more, but the result of these discussions seems to be that people are more confused and puzzled regarding the actual status of the Amalgamated Copper Company and the resulting sharp decline in the share market than ever before. People are becoming convinced that Amalgamated is a Wall Street street game, which it is better to watch than mingle with. The declaration of the regular $3 semi-annual dividend by the Osceola Consolidated management was expected and had no effect on the stock, which has ranged from $98 to $100. It is expected that the Tamarack management will declare the usual $10 dividend, but the stock displays a heavy tone, breaking to $280 to-day. A report comes from the Lake District that the Isle Royale Mine is getting better results from its rock. Old Dominion maintains its strength and quickly recovers any setbacks that may come from general weakness. The Mass Mine is estimated to have native silver in its waste sands which the company will plan to save. The Champion Mine is expected to become a producer of mineral as soon as the Baltic's mill starts. This will release two heads of stamps at the Atlantic.

The closing of copper shares is remarkable for the strength in face of the refractory Amalgamated.

Salt Lake. Nov. 23.

(From Our Special Correspondent.)

The mining stock market on the Salt Lake exchange closed with a slightly better tone than the previous week, 461,113 shares changing hands. The directors of the East Valeo Mining Company, near Park City, met on Monday, November 18, in Salt Lake City and assessed the stockholders 1-2c. per share, payable immediately. The directors of the Constellation Mining Company, of Park City, was held on November 16, and assessment No. 28 of 1 1-2c. per share was levied, made payable immediately.

The stockholders of the Anchor Mining Company, of Park City, met for the annual meeting on November 21 and re-elected the old board of directors, as follows: E. F. Holmes, president; W. V. Rice, vice-president; H. E. Meyers, secretary and treasurer, with R. T. King, F. A. Nims, S. C. Tewksbury, D. D. Erwin, Henry Newall and James Farrell, completing the board, it is understood. There will be no alterations made in the working of the mine. The Utah-Colorado Oil Company has amended its articles of incorporation, making the capital stock 1,000,000 shares of $1 per share instead of 500,000 shares at $1 per share.

DIVIDENDS.

Name of Company	Latest Dividend—Per Date.	Per Share.	Total.	Total to date
†Ala. Con. Coal & I. pf.	Dec. 1	1.75	43,750	393,750
Arrow, Colo.	Nov. 29	.05	50,000	50,000
Breece, Colo.	Dec. 2	.20	$40,000	$170,000
*Bunker Hill & Sull.	Dec. 4	.07	21,000	1,305,000
†Cambria Steel	Dec. 1	1.50	1,350,000	3,750,000
†Gen'l Chem., com.	Dec. 2	1.00	71,679	700,982
*Guadalupe, Mex.	Nov. 24	1.37	13,725	3,381,950
†Mont. Ore Purchasing	Nov. 30	1.00	81,000	2,322,000
Mont. Ore Purch., extra	Nov. 30	1.00	81,000	.....
†National Lead pf.	Dec. 16	1.75	260,820	11,883,560
North Star, B. C.	Dec. 15	.01½	19,500	256,500
Ontario Silver, Utah	Dec. 20	.30	45,000	14,735,500
†Ohio & Ind. Nat. Gas.	Dec. 2	1.00	90,000	720,000
Osceola, Mich.	Dec. 23	3.00	287,700	4,245,800
*Penoles, Mex.	Nov. 31	22.63	56,575	1,296,175
San Carlos, Minillas, Mex.	Nov. 30	6.79	16,904	195,854
*San Francisco, Mex.	Nov. 30	.45	2,700	223,140
Sta. Marie de Guad., Mex.	Dec. 10	4.53	11,325	292,600
*Standard Oil.	Dec. 16	8.00	7,660,000	119,585,000
†U. S. Steel com.	Dec. 20	1.00	5,082,347	10,143,462
Utah Con. Copper.	Dec. 10	1.22	366,000	732,000
West Shore Oil, Cal.	Nov. 30	.05	5,000	15,000

*Monthly. †Quarterly.

ASSESSMENTS.

Name of Company.	Location.	No.	Delinq.	Sale.	Amt.
Alta	Nev.	..	Nov. 22	Dec. 20	.05
Am. Oil & Ref.	Cal.	..	Nov. 25	Dec. 23	.05
Badger.	Ore.	..	Nov. 30	.....	.05
Belcher.	Nev.	..	Dec. 8	Dec. 31	.10
Black Hawk	Utah.	..	Nov. 18	Dec. 9	.001½
Canton Placer	Cal.	2	Jan. 6	.....	.02
Cal. Dredging	Cal.	3	Nov. 25	Dec. 16	10.00
Goleta Con.	Cal.	3	Nov. 29	Dec. 28	.10
Mexican.	Nev.	69	Dec. 17	Jan. 7	.10
Mohican.	Cal.	..	Jan. 4	.....	.05
Orient	Cal.	..	Dec. 12	.....	.35
Ridge & Valley	Utah.	3	Dec. 10	Dec. 30	.02
Sharp.	Utah.	4	Nov. 19	Dec. 16	.03
Shower Con.	Utah.	5	Nov. 30	Dec. 23	.02
Sierra Nevada	Nev.	..	Dec. 17	.....	.10
Silver Cloud.	Utah.	5	Nov. 11	Nov. 30	.00½
Tanana.	Cal.	4	Nov. 4	Dec. 2	.10
Tetro.	Utah.	21	Dec. 7	Dec. 31	.01
Thorpe.	Cal.	11	Nov. 16	Dec. 9	.01
Utah Con.	Nev.	..	Nov. 30	Dec. 24	.05
Yuba Con.	Cal.	4	Nov. 11	Dec. 2	.03

San Francisco. Nov. 16.

(From Our Special Correspondent.)

Business was quiet during the week, but prices were fairly maintained. Consolidated California & Virginia sold at $1.65; Ophir, 77@78c.; Silver Hill, 32c.; Caledonia, 24c.; Mexican, 20c.; Sierra Nevada, 10c.; Savage, 6c.; Potosi, 4c.

It is reported that a body of ore has been struck on the 1,600 level in Mexican ground.

The Overman Mining Company has levied an assessment of 5c. a share, delinquent December 24.

On the Producers' Oil Exchange the trading was somewhat more active. Sales were larger, but there was little change in prices. Some quotations noted are: Peerless, $5; Home, $3.45; Monte Cristo, $1.70; Reed Crude, 35c.; Giant, 31c.; Bay City, 25c.; Junction, 25c.; Lion, 8c. The favorites in the trading were Home, Bay City, Junction and Lion.

London. Nov. 12.

(From Our Special Correspondent.)

The mining market as usual has been very dull all week, and transactions have been few. West Africans have received some support from the Gold-fields group, but otherwise prices have been very shaky. The West Australian market has again been upset, this time by the mysterious resignation of Mr. C. D. Rose from the directorate of all the companies he was connected with. It is only recently that Mr. Rose went on the board of Lake View Consols and Ivanhoe Gold, when the Kaufman group captured these companies from Whitaker Wright, though he had been on the board of the Golden Horseshoe some time before. No credible explanation has been given of this sudden resignation, but it is generally understood that he did not agree with the system of insiders making use of information from the mine for stock exchange purposes before the information was given to the public and the shareholders. Mr. Rose is of course a man of position and means, and one can easily understand that his experience, short as it is of London mining methods has made him decide to be out of it. His retirement from these companies has had a very bad effect on the West Australian market, for it shows that the promised improvements in the management are not to be realized.

The South African market has been livened up by the culmination of a dispute on the board of the Van Ryn Company. The Van Ryn Mine is at the east end of the Rand, and its values are lower than the mines in the central section. Until 1898 the various reefs were not exploited systematically, and the extraction was low. The company then induced Mr. George Albu to take an interest in the property, and he thoroughly reorganized the mine and plant and got them into excellent shape. A few months ago Mr. Albu discovered that some of the directors and others connected with the financial house that controlled the company, were communicating with his engineer behind his back, and he at once resigned his position as managing director. The independent directors, however, desired that he should not take this step, as they considered it would mean ruin to the company, so they called a meeting of shareholders to discuss the matter in public. The shareholders when the matter was put to a vote, decided to reinstate Mr. Albu, who thus gained a signal and gratifying victory. Judging by the excellent manner in which he pulled the property out of the mire and put it into shape, it is difficult to see how an unprejudiced shareholder could have done anything else than support him.

While English shareholders are still being worried by the Siberian Gold-fields Development Company, the Hooley company which never obtained the concessions that it claimed to hold from the Russian Government, a new company to exploit Siberian placers has been formed called the Amur Syndicate, Limited. This syndicate is to acquire an option from Mr. D. A. Ruffmann, of St. Petersburg, to work certain properties in the Amur District of Eastern Siberia. Reports on the properties have been made by Mr. A. Fortunato, a Russian mining engineer of repute, and by Professor Galloway, of Cardiff. The properties appear to be very extensive, and they have been worked by the Russian owners under lease from the imperial authorities. It is the intention of the syndicate to send out another mining engineer from London to make a report, and then to offer the properties to the public.

A few weeks ago I mentioned that the Montana Mining Company had decided to abandon further development work at the Drumlummon Mine, and was actively engaged in looking out for new properties. The report of this company now published shows that one new property has already been acquired and is being furnished with a 20-stamp mill and Frue vanners. A good deal of prospecting and development work has been done on outside claims owned by the company, and on adjoining properties that had been taken on bond. Most of the work has been abandoned as the results were not encouraging, but the bond on one set of claims has been continued, and there is every prospect that it will be taken up as the results are very promising. Though development work on the Drumlummon has been abandoned, there continues to be plenty of work for the plant, as there are great accumulations of tailings that are being treated, and ore is still being picked out of the upper levels sufficient to keep a number of stamps going. This may continue for months yet. The profits of treatment during the past 6 months have been slightly exceeded by the cost of exploring work, but the company still has £50,000 in cash in hand, so it is in a strong position for the acquirement of new properties.

The anxiety about the Le Roi group is increasing, and all sorts of rumors are being circulated. The retirement of Mr. Macdonald is not altogether liked, as no reason has been given for it. Mr. Macdonald is a capable enough manager, and it is generally supposed that the directors wanted one of their own men in the position. The sampling of the mine is taking longer than at first was promised, and Mr. Frecheville's opinion is being delayed, so it is not likely that the public will have any report much before Christmas. In the meantime the shares have fallen to par, £5. after having been at £7 or £8 for some time.

Paragraphs have been appearing in the press recently to the effect that a plant is being installed off the coast of Cornwall to recover gold from the Atlantic Ocean, and a company with large capital has been formed to conduct the operations. There have been many such schemes put before the public both in England and America at one time and another; most of them have been rank swindles, and all of them failures. It is stated that the sea water off the coast of Cornwall is richer in gold than in other districts, presumably because it is on the line of the gulf stream that comes from Mexico. It may, however, be pointed out seriously that the present workers have an advantage in working on the line of the gulf stream, in that they will not be troubled so much with the tailings difficulty which hampers most of these schemes. A good deal of economy will also result from the fact that no power will have to be used in pumping. But for all that the other difficulties will assuredly overweigh any advantage so gained.

Paris. Nov. 17.

(From Our Special Correspondent.)

The Bourse continues uneasy, and speculation is not active. The mining shares especially have suffered and very little business is being done. The only sign of life is in DeBeers shares and a few of the copper stocks. In the former, the re-arrangement of capital seems to be acceptable to most of those interested. In copper shares some strength is shown; the price of copper in London has improved, and some begin to believe that the present quotations for the metal can be maintained. This feeling will probably lead to more buying from those manufacturers who have avoided the purchase of metal, in the belief that it could soon be had at a lower price.

The shares of the Russian group recovered a little this week. It can hardly be called a reaction—it is simply an arrest of movement. One cannot say that these stocks are higher, only that they have not fallen. Even that is a gain in our present condition.

The foreign commerce of France for the 10 months ending October 31 is reported by the Ministry of Commerce as below:

	1900. Francs.	1901. Francs.
Imports	3,877,548,000	3,934,289,000
Exports	3,365,245,000	3,430,899,000
Excess, imports	512,303,000	503,390,000

There was an increase of 56,741,000 fr. in the imports, and an increase also of 65,654,000 fr. in the exports; the result being a decrease of 8,913,000 fr. only in the excess of imports.

The movement of gold and silver in France for the 9 months ending September 30, is reported by the Ministry of Commerce as below:

	Imports. Francs.	Exports. Francs.	Excess. Francs.
Gold:			
1901	245,175,000	97,622,000	I. 147,553,000
1900	346,580,000	60,077,000	I. 286,503,000
Silver:			
1901	76,405,000	105,549,000	E. 29,144,000
1900	112,907,000	152,645,000	E. 29,738,000

Imports of copper and nickel coins, taken at their face or coin values, were 77,000 fr. this year, against 48,000 fr. in 1900. Exports were 253,000 fr., as compared with 260,000 fr. last year.

The report of the Paris Mint for 1900, just published, shows that in that year there were 62,620,984 coins turned out, of which 24,722,074 pieces were French money, 24,477,490 were for French colonies and 13,420,940 for foreign nations. The face value of these coins was 120,916,085 fr. The French money included approximately 30,000,000 fr. in gold coins, 6,000,000 fr. in silver and 2,000,000 fr. in minor coins.

The finance committee of the Chamber of Deputies has approved the proposal for a government monopoly of the sale of petroleum and its products, and is now

considering the details of the plan. The monopoly is expected to yield a considerable revenue.

The coal question is still in a very uncertain condition, and the future action of the mines is not determined. The chances seem to be in favor of a general strike of the miners, with resulting disturbances in all trades and industries. The action of such a strike on the coal operators, who are now facing a falling market, cannot fail to be disastrous.

The prospect is discouraging to all speculation—and values continue to fall. AZOTE.

COAL TRADE REVIEW.

New York. Nov. 29.

ANTHRACITE.

A seasonable cold wave has increased retail buying in all anthracite-burning territory and stirred up those dealers whose yards are not well enough stocked. The market would not have sagged had the weather remained mild, for the coal mined has been going directly to dealers and consumers and the large producing companies have stored but little. The cold wave simply calls attention to the success achieved by the community of interest plan in coal production and distribution this year; not since the early 70's have the anthracite companies seen such prosperous times. The outlook favors a good movement from the mines for the balance of the year, the chief limitation on production being car supply. The year's output should be considerably in excess of 50,000,000 tons, a good gain over last year and the largest output on record.

In the Northwest, trade conditions show little change. Navigation on the lakes is about over and very few cargoes are due to arrive at Superior and Duluth. Supplies on the docks there are probably insufficient to last the winter through, but better than were expected a month or two ago. In Chicago territory retail buyers have felt the cold snap and orders from out of town yards have increased. The prevailing shortage of cars continues to affect the movement to inland points and the arrivals of all-rail coal. Supplies on docks are fairly good. Freight rates from Buffalo are 80c. per ton or over, and though vessels can get through the Mackinaw Straits after the Sault is closed by ice, yet the amount of coal to arrive by lake during the next few weeks will probably not be great. At lower lake points and in Canadian territory trade is good. Along the Atlantic seaboard, where buying feels weather conditions most, the cold wave has improved demand greatly, and the dull market which some pessimists expected is not in sight. At Philadelphia, New York and Boston market conditions are excellent. The car supply continues to affect shipments to all rail points, and concerns not having their own barges find it difficult to get vessels for coastwise trade owing to the stormy weather. Some of the antharcite roads continue to embargo shipments to points off their own lines. At New York Harbor ports the f. o. b. prices for free-burning white ash coal are: Broken, $4; egg, $4.25; stove and nut, $4.50.

BITUMINOUS.

Demand in the Atlantic seaboard soft coal trade is even stronger than it has been, while the supply of coal available does not improve. The supply of cars at the mines continues short and irregular, curtailing shipments correspondingly. Two violent storms have tied up a lot of vessels along the coast and arrivals at the shipping ports have been scanty. As a result coastwise freights are strong. The pronounced rise in freight rates during the past two weeks, however, is expected in a short time to cause vessels that have been taking off-shore business to take coastwise shipments.

In the Far East the demand for coal continues good. Supplies there have been thought better than in any other territory. Shipments to that territory have been restricted and the prevailing scarcity of vessels is likely to last for some time, consequently the demands from dealers are bound to be louder before long. Along Long Island Sound the situation is worse than it was. The amount of coal wanted is far in excess of what producers are able to supply. Producers, however, are doing the best they can to keep their regular customers going. At New York Harbor the supply, as compared with the demand, is scantier than last week. Premiums of 25c. per ton for prompt delivery are frequently readily paid, and the coal thus secured is often of the poorest quality. All rail trade shows no let up in the orders sent to producers, and here as in other territory, producers ship what they can to the concerns they think in greatest need. Transportation from the mines to tidewater has been hampered by bad weather and is no better than it was last week, cars coming through slowly. Car supply at the collieries has been from about 25 per cent to 50 per cent of the total number wanted. In the coastwise vessel market high winds have kept down arrivals at the shipping ports and the number of vessels available is less than a week ago. Freight rates consequently are climbing. We quote 85@90c. from Philadelphia to Providence, New Bedford and the Sound, and $1@$1.10 to Boston, Salem and Portland.

Coal is selling at the seaboard shipping ports at full circular figures. It is often difficult to give actual prices, since the premiums paid for prompt delivery are regulated by the necessities of buyers.

Birmingham. Nov. 25.

(From Our Special Correspondent.)

There is such a scarcity of cars in Alabama that many orders for coal are being delayed. Fuel agents of more than one railroad getting coal from this district came here last week looking after contracts for fuel which are being filled by operators in this district. One in particular was Agent Fitzsimmons, of the Plant System, which has contracts in this territory for 160,000 tons of coal during the season and a great amount is being required just now. It is stated that the railroads are providing themselves with more cars and that the new cars are constructed for lumber as well as coal hauling.

The production of coal in Alabama continues to increase and several new mines are being worked. There has been no change in the prices. The mine operators have good orders on hand which will require much coal. The larger producers are breaking records right along. The Republic Iron and Steel Company is now producing more coal in Alabama than it ever did before, its mines at Sayreton and Warner getting out a large output.

Cleveland. Nov. 26.

(From Our Special Correspondent.)

The situation is growing more aggravating for the lake shippers of coal as the season of navigation draws to a close. Up until this time most of the shippers have been able to get about one-half of the coal they actually needed to meet their contracts with the consignees at the upper lake ports. During the week just closed they have been able to obtain only one-third of the required amount of coal. Most of them have pleaded with the railroads for relief and while the latter are inclined to favor the shippers as far as possible they nevertheless find it impossible to spare the needed cars from other shipments, and likewise lack the motive power to move the trains when they are made up ready for movement. Laboring under such circumstances the shippers are forced to witness the tantalizing spectable of a great abundance of lake tonnage for the movement of whatever amount of coal might be expected to be forwarded to the lake ports under ordinary circumstances. Many boats are now being offered for coal cargoes that have not been in that trade all summer and in fact some of the exclusive fleet of the Pittsburg Steamship Company have been on the market for cargoes. This is easily explained on the basis that the coal is needed to ballast the boats during a trip beset by rough weather. It is therefore clear that many of the shippers will be short on their contracts when the season ends, and it will not be because of a lack of tonnage either.

Pittsburg. Nov. 26.

(From Our Special Correspondent.)

Coal.—The rise in the rivers that has been expected for over a month has arrived and a great deal of coal will go out. Trouble between the pilots' organization and the coal combination will prevent the shipment of several million bushels. The demands of the pilots, made last June, have not been granted by the Monongahela River Consolidated Coal and Coke Company and only those whose annual contracts with the company have not expired will take out towboats. All the independent companies have acceded to the terms of the pilots and are able to send out every pound of coal they have loaded. It is estimated that the shipments of the independent concerns will aggregate 4,000,000 bush. The combine has almost 25,000,000 bush. loaded and has enough tow-boats in port to send out fully half that amount, but owing to the trouble with the pilots cannot possibly ship more than 6,000,000 bush. Fully 18,000,000 bush. will be left in the harbor and pools unless a compromise can be effected with the pilots before tomorrow as the high water is expected to last only a day or two. The Pittsburg Coal Company, the railroad coal combination, has been more seriously handicapped in its shipments this week as the shortage of cars is greater.

Connellsville Coke.—Prices remain unchanged and there is little likelihood that rates will be advanced on the first of the year as has been predicted for some time. Standard furnace coke remains at $2 and foundry at $2.50@$2.75. There was but slight change in the production and shipments. Of the 21,833 ovens in the Connellsville region 19,941 were active and 1,892 were idle. The production for the week was 236,155 tons. The shipments aggregated 10,446 cars distributed as follows: To Pittsburg and river tipples, 3,577 cars; to points west of Pittsburg, 5,028 cars; to points east of Connellsville, 1841 cars.

Foreign Coal Market. Nov. 28.

Shipments of coal abroad continue steadily, business to the West Indies and South American ports being especially good. Some business to France and Mediterranean ports is also noted.

Charters from the United States for future shipments are easy. From Philadelphia to La Pallice, France a December-January sailing was booked at 8s. 3d. ($1.98).

Messrs. Hull, Blyth & Co., of London and Cardiff, report under date of November 16, that at Cardiff the large coal market continues a trifle easier with little actual business passing. Prices are as follows: Best Welsh steam coal, $4.20@$4.32; seconds, $3.96@$4.02; thirds, $3.90; dry coals, $4.02; best Monmouthshire, $3.78@$3.84; seconds, $3.48; best small steam coal, $2.88@$3.00; seconds, $2.52@$2.76; other sorts, $2.40.

The above prices for Cardiff coals are all f. o. b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f. o. b. Newport, exclusive of wharfage, but inclusive of export duty, and are for cash in 30 days, less 2 1-2 per cent discount.

Rates of freight remain about unaltered, with Italy slightly easier. Some rates quoted from Cardiff are: Algiers, $1.30; Marseilles, $1.35; Genoa, $1.32; Naples, $1.32; Port Said, $1.32; Singapore, $2.88; Las Palmas, $1.44; St. Vincent, $1.62; Rio Janeiro, $2.70; Santos, $2.88; Buenos Aires, $2.64.

SLATE TRADE REVIEW.

New York. Nov. 29.

The list of prices per square of No. 1 slate, standard brand, f. o. b. at quarries in car-load lots, is given below:

Size, Inches	Monson or Br'ville.	Bangor.	Bangor Ribbon.	Alb'n or Jackson Bangor.	Chap'n Keystone.	Peach Bottom.	Sea Gr'n.	Unfad'g Green.	Red.
	$.	$.	$.	$.	$.	$.	$.	$.	$.
24 x 14....	6.50	3.50	3.00	3.25	...	5.30	3.00	...	....
24 x 12....	6.60	3.50	3.00	3.25	4.00	5.50	3.00	3.75	....
22 x 12....	6.60	3.50	3.25	3.50	...	5.50	3.00	3.75	....
22 x 11....	6.50	3.75	3.25	3.50	4.00	5.50	3.00	4.00	....
20 x 12....	6.90	3.75	3.25	3.50	...	5.50	3.00	3.75	....
20 x 11....	6.80	...	...	3.75	...	5.50	3.00	...	....
20 x 10....	6.80	4.25	3.50	3.75	4.00	5.60	3.00	4.25	10.50
18 x 12....	6.80	3.75	3.25	3.50	...	5.50	3.00	3.75	....
18 x 11....	7.00	...	...	...	...	...	3.00	3.75	....
18 x 10....	7.00	4.25	3.50	3.75	4.00	5.60	3.00	4.00	10.50
18 x 9....	7.00	4.50	3.50	3.75	4.00	5.60	3.00	4.25	10.50
16 x 12....	6.80	3.75	...	3.50	...	...	2.90	3.75	....
16 x 10....	7.00	4.00	3.50	3.75	4.00	5.60	2.90	4.00	10.50
16 x 9....	7.00	4.25	...	3.75	4.00	5.60	2.90	4.25	10.50
16 x 8....	7.00	4.25	3.50	3.75	4.25	5.60	2.90	4.25	10.50
14 x 10....	6.60	3.75	3.25	3.25	...	5.50	2.70	3.75	10.50
14 x 9....	6.50	...	...	...	...	...	2.70	3.75	10.50
14 x 8....	6.60	3.75	3.25	3.25	4.00	5.30	2.70	4.25	10.50
14 x 7....	6.40	3.75	3.25	3.25	3.75	5.30	2.50	4.25	10.50
12 x 10....	5.75	...	...	...	...	...	2.50	3.25	....
12 x 9....	5.60	...	...	...	...	...	2.50	3.25	....
12 x 8....	5.50	3.50	...	3.00	...	5.00	2.50	3.50	9.00
12 x 7....	5.00	3.25	...	3.00	3.25	5.00	2.00	3.50	9.00
12 x 6....	4.80	3.25	...	3.00	3.25	4.85	2.00	3.50	8.50

A square of slate is 100 sq. ft. as laid on the roof.

Trade is good, especially in roofing slate. Dealers report a continued scarcity of some sizes, which delay shipment on orders taken some time ago. Prices are firm.

The foreign market is quiet. Further shipments of large-sized roofing slate have been made to Copenhagen, Denmark. A lot has also been forwarded to Sydney, New South Wales. Great Britain is not taking the usual quantity, as speculative building is less than it has been. Customarily less than 15 car loads are shipped on a steamer, as British orders are being filled as promptly as quarrymen are able to do so. Just at present stockpiles of export sizes are small. Ocean freight rates are easy, though they are expected to become firmer with the turn of the month.

IRON MARKET REVIEW.

NEW YORK, Nov. 29.

Pig Iron Production and Furnaces in Blast.

Fuel used.	Week ending Nov. 30, 1900. F'ces.	Tons.	Nov. 29, 1901. F'ces.	Tons.	From Jan., '00. Tons.	From Jan., '01. Tons.
Anth and coke	171	207,950	237	313,925	12,440,987	14,059,574
Charcoal	30	8,150	22	7,150	353,345	365,905
Total	201	216,000	259	321,075	12,794,332	14,425,479

The iron and steel markets continue very active, and there seems to be no cessation in the coming forward of new contracts. In finished material the chief demand is for structural steel, which is required for new works in progress or under consideration. Rails are also in demand. New electric railroad enterprises calling for a considerable tonnage of girder rails are in the market, in addition to those steam railroads which have not covered their supplies.

In raw material sales of pig iron are reported at advances of from 25 to 50c. over previous quotations. There is also talk of another advance on Southern iron. Outside of this no material changes in prices are reported.

The new steel combination is still being discussed, but no definite conclusions have been reached—or at least made public.

Little is heard just now of export business, though reports are current of an order for structural work taken by the American Bridge Company. Mills, however, are generally so busy that they are not looking for foreign orders, nor disposed to make concessions to secure such business.

Birmingham. Nov. 25.

(From Our Special Correspondent.)

The pig iron market is still strong notwithstanding the recent advance in prices in this section and much iron is being shipped. Some of the furnaces are said to be sold up for at least three months of next year. Preparations are being made to materially increase the production in this State and before the last of January there should be no less than four furnaces in operation which are now not making iron. The Sloss-Sheffield Steel and Iron Company will blow in one furnace this week. The furnace at Talladega, Ala., the property of the Northern Alabama Coal, Iron and Railroad Company, will be ready for operation within three weeks. Ore and other raw materials are now being placed. The big furnace of the Republic Iron and Steel Company, of which much has been said heretofore, is almost ready for the torch. The Tennessee Coal, Iron and Railroad Company should have two furnaces at Bessemer ready shortly and the Woodward Iron Company is still working on its second furnace at Woodward.

The shipments during the first ten months of the year were made public during the past week. The aggregate shipments of pig iron, cast iron pipe and steel from Alabama and Tennessee during the 10 months ending October 31, were 1,393,987 tons, of which 1,254,596 tons were pig iron and 139,391 tons were cast iron pipe. The total amount of pig iron exported was 21,236 tons which is less than was shipped during September, October, November or December, 1900. The export cast iron pipe shipments amounted to 2,329 tons, a decided decrease from the shipments in 1900. The Birmingham District made a good showing during 10 months, the total pig iron movement amounting to 662,127 tons. Cast iron pipe shipments amounted to 69,035. In all 19,757 tons of pig iron and 1,290 tons of cast iron pipe were exported from the Birmingham District in the 10 months. The reports show that 47,954 tons of steel billets were shipped from Ensley, near Birmingham.

The following quotations are now given: No. 1 foundry, $12; No. 2 foundry, $11.50; No. 3 foundry, $10.50@$11; No. 4 foundry, $10.50@$10.75; gray forge, $10@$10.25; No. 1 soft, $12; No. 2 soft, $11.50.

The steel plant at Ensley is working steadily and the output is heavier than it has been for some time. Some experiments are being made with crude oil at the steel plant just now, the oil being used in the place of gas. The oil is found to be steady in its heat, but transportation from the oil fields will probably prevent a general use of this kind of fuel.

It is rumored in this district that the Republic Iron and Steel Company and the Sloss-Sheffield Steel and Iron Company, two of the larger companies in this district, are to be part of the new steel and iron combination being formed. It is believed that when the directors of the Republic Company meet this week they will definitely decide on the construction of the much talked of steel plant at Thomas, near Birmingham.

Cleveland. Nov. 26.

(From Our Special Correspondent.)

Iron Ore.—It is quite evident now that the last shipments of iron ore, in chartered vessels, are being made for this season. The ore is frozen in the pockets and the vessel men do not care to take those cargoes unless they are forced to by the lack of business in other lines. Not being reduced to this extremity they are keeping clear of the trade. The shippers have but little material at best, most of their needs being provided for by contract vessels in addition to those which they own. The rates do not change from $1.25 from Duluth: $1.15 from Marquette; and 90c. from Escanaba. There is no change in the price of ore as quoted by the producers although there are no sales. Bessemer is quoted at $4.25; non-bessemer and Mesabi at $3.

Pig Iron.—Producers of foundry grades have about withdrawn their product from the market for the time being, having no iron to sell, at least before the first of the year, and some foundry producers are in no position to make offers even then. Added to the scarcity of iron is the still greater scarcity of cars which is preventing the shipment of material which is on hand. The market is strong at the old prices. $14.50 in the Valley being the minimum for No. 2 and some producers holding for better figures. The prices of basic and bessemer iron have not been fixed for the first quarter of next year, although there are reports that some basic has been sold in small lots at $15 in the Valleys. It has not been in sufficient quantities to make the market and none of the big users of the material have been buying any material whatever. The Steel Corporations is still figuring on bessemer, but it has not bought anything yet. The price will hardly be less than $15.25 in the Valleys.

Finished Material.—The car shortage is being felt so seriously in the finished material trade that some of the mills are now making the announcement that unless some relief comes soon, which is expected with the close of the season of navigation, some of the plants will be forced to close down, having no further place in which to store their material. The production, however, keeps up and the ordering is on the plane with production. Steel rails are now being sold well into the fourth quarter and many of the mills are fearful that they have already oversold their output. Steel plate is looking up very much, the orders having come in in such quantities of late as to tie up the output of the mills for some time to come. The car shops and the ship yards are both ordering heavily. The price does not change, holding at 1.70c. Bars are also in better demand and all appearance of weakness in this trade has disappeared. The sales in fact are in excess of production now, a statement which it is possible to make for the first time since the recent increase in the productive capacity. The prices do not change from 1.50 c., Pittsburg, on iron and bessemer steel bars and 1.60c. on open-hearth steel bars. Structural material producers are now unable to offer anything to the buyers before the first of March and some of the latter fearing that the output will be sold up before they get upon the market have bought heavily in advance of requirements, providing for their needs as far as the first of July next year. This is an altogether uncommon occurrence, especially for this time of the year. All shapes are bringing 1.70c. Some gauges of sheets are scarce and deliveries on the intermediate gauges are not promised inside of seven or eight weeks.

Philadelphia. Nov. 27.

(From Our Special Correspondent.)

Pig Iron.—Foundry irons of all numbers and grades have been attracting more attention during the past week than any other, and in two or three instances large conracts were placed for late deliveries at quite an advance. Agents report a number of foundrymen as having very little stock and makers, especially of the finer grades, say they are unable to promise all the iron that their regular customers want. There is no dullness in any branch. Forge production is no more than equal to mill demands, and this week's business was done at 25c. better. Basic pig has moved up a peg and the condition of bessemer pig is hard to define correctly, there being so many factors in the West which we are not in touch with. The whole pig iron situation is very strong and rumors are circulated that a general advance is probable.

Billets.—Our buyers are not in the market at present and most of them have placed contracts. The consumption of stock is up to our capacity and the more we get from the mills makes it look as though higher prices were sure.

Merchant Bars.—The store and mill people all say they are doing all the business they can take care of at 1.65@1.70c. and frequently a tenth or two higher for retail demand, even up to 2c.

Sheets.—The only positive statement from high authority is that all mill capacity is far oversold. There is an apparent lull in demand. No. 28 is 4.40c.

Pipe and Tubes.—The reports from tube offices hereabouts are that the pressure of work among the customers of tube mill is even greater than a month ago. Pipe work has not fallen off perceptibly and prices have not been shaded except when large and long running contracts were considered. Our store people are loading up with good paying work for the winter.

Merchant Steel.—The agents for merchant steel deny that there has been any shading in prices, but the assertion is made that large contracts for spring delivery have been placed on more favorable terms for buyers. There is probably some truth in the statement.

Nails.—A good demand has kept up for nails nearly all along. Our building operations have gone ahead of any autumn for three or four years.

Plates.—There are a good many contradictory statements afloat concerning the much talked of combination. As to our daily business, our retail trade is excellent, but the large orders have dropped off here.

Structural Material.—The manufacturers are reticent as to the probable course of structural material next spring, concerning which there has been some talk. Propositions are now under consideration abroad for bridge material and our people expect to win some contracts running into thousands of tons. No charge in card rates, but there is an irregularity in prices named for small lots.

Steel Rails.—Nothing is known in this market. Trolley material will probably be in unusual demand this winter. A great deal of trolley line work is being financed for next spring.

Scrap.—The scrap dealers control the situation. Not much business is being done and there is no drop in prices for heavy scrap.

Pittsburg. Nov. 26.

(From Our Special Correspondent.)

Bessemer pig iron has been sold this week in small lots at a premium of 50 and 75c., most of it being sold at the highest price of the year, $16, Valley furnaces, which means $16.75, Pittsburg. This, of course, is due to the continued shortage of railroad cars, and cars are scarcer this week than last. Loaded cars are blocked at many points on the roads leading to this city. A strike of switchmen is now threatened which will make a more serious complication of affairs. The Switchmen's Union has made demands on the railroads which have been refused, but negotiations are pending. The Brotherhood of Railroad Trainmen, composed of switchmen, is the strongest organization, and its leaders say they will not permit a strike of the rival organization to seriously interfere with traffic and will endeavor to supply the places of all men who quit work. The Brotherhood people, however, have some matters in the existing contracts with the railroads that it desires to correct, but say they will not attempt to enforce a settlement while the Switchmen's Union's demands are pending. The situation is not believed to be at all critical. About 200 men went out, but their places were promptly filled.

Gray forge is extremely active and several thousand tons have been sold at a much higher price than last week. Foundry iron is also stronger. Sales of bessemer steel billets have been made for the first time in many months and the price was higher than has been quoted at any time this year. The market for steel bars and plates is unchanged and the situation is about the same as it has been for several weeks. The demand for structural material for delivery next year is unusually strong and contracts for several thousand tons have just been placed. There is no change in sheets, deliveries not improving, but the demand continues heavy.

Pig Iron.—Sales of bessemer pig iron this week amounted to over 2,500 tons for immediate delivery at prices ranging from $15.75 to $16, Valley furnaces, of $16.75, Pittsburg. The United States Steel Corporation has covered its requirements for most of next month and did not buy this week. Gray forge was unusually active and 5,000 tons were sold at prices ranging from $14.75 to $15.25, Pittsburg. This is an advance over last week's prices. Foundry No. 2 is also stronger, several thousand tons being sold at $15.50@$15.75, Pittsburg.

Steel.—The feature of the steel market this week was the sale of 1,500 tons of bessemer billets at $28.50. It was in small lots for prompt shipment. Steel bars continue to be quoted at 1.50c. and but little new business was received, although the mills are all active. Tank plate prices remain at 1.60c. and deliveries can be made more promptly, as but little new business has been taken.

Sheets.—There is but little new in the sheet market. The demand is good and prices are unchanged. No. 28 gauge for future delivery is quoted by the American Sheet Steel Company at 3.10c. Galvanized sheets are quoted at 70 and 10 per cent off and for spot delivery at 70 per cent off.

Ferro-manganese.—There is no change in the market. Domestic 80 per cent remains at $53.50 and the foreign product is still quoted at $50.

New York. Nov. 29.

Pig Iron.—The market is strong. Contracts for delivery into the third and fourth quarters of next year are being made. We quote for tidewater delivery: No. IX foundry, $15.75@$16.75; No. 2X, $15.25 @15.65; No. 2 plain, $14.65@15.15; gray forge, $14.35 @$14.85. For Southern iron on dock, New York, No. 1 foundry, $15.50@$15.75; No. 2, $14.75@$15.25; No. 3, $14.50@$14.75; No. 4, $14.@$14.50; No. 1 soft, $15.50 @$15.75; No. 2, $14.75@$15.25.

Bar Iron and Steel.—Demand is excellent. No change in prices is expected before the end of the year. We quote 1.58c. for common bars in large lots on dock; refined bars, 1.63@1.68c.; soft steel bars 1.65c.

Plates.—The market is strong and consumption is steady. Eastern mills quote for tidewater delivery in carloads: Tank, 1-4-in. and heavier, 1.78c.; flange, 1.88c.; marine, 1.98c.; universals, 1.78c.

Steel Rails and Rail Fastenings.—Contracts for delivery into the last half of next year continue to be placed. Standard sections are still quoted at $28 at

Eastern mills; light rails at $28@$30, acording to weight. Spikes are 1.80c.; splice bars, 1.55c.; bolts, 2.60@2.70c.

Structural Material.—Consumption shows no falling off, and prices are very firm. We quote for large lots at tidewater as follows: Beams, 1.75c.; channels, 1.75c.; tees, 1.80c.; angles, 1.75c.

CHEMICALS AND MINERALS.

(For further prices of chemicals, minerals and rare elements, see page 744.)

New York. Nov. 29.

Heavy Chemicals.—Orders continue good both for prompt and forward shipments, especially for the latter. Prices are generally firm. Further sales of next year's bleach have been made at quotations below. Domestic chlorate of potash sold over 1902 at $7.50@$7.75 per 100 lbs., while immediate shipments are obtainable at $8.25@$8.75, according to make.

Prices per 100 lbs. are as below:

	Domestic.		Foreign.
Articles.	F. o b Works.	In New York.	In New York.
Alkali 58%...	77½ @ 82½	.....	.....
Alkali 48%...	82½ @ 87½	.....	.....
Caustic Soda, high test....	$1.90 @$1.95	.....	$2.25 @$2.50
powd. 60%..	.....	2.75	.....
70@74%..	.....	2.85 @ 3.00	.....
98%..	.....	3.25	3.75 @ 4.00
Sal. Soda.....	.55.	.65	.70
Sal. Soda conc.	1.25 @ 1.50	.....	.....
Bicarb. Soda .	1.00 @ 1.10	.....	1.37½@ 1.75
Bicarb. Soda, extra.....	3.25 @ 3.50	.....	.....
Bleach. Pdr.:			
Eng. prime.	.....	.....	1.75 @ 1.80
Other brands	.....	.....	1.70 @ 1.80
Chl. Pot. cryst.	.....	8.25 @ 8.37½	10.00 @10.25
Chl. Pot. powd.	.....	8.37½@ 8.62½	10.50 @10.75

Acids.—Contracts for next year's muriatic acid are about closed up, and in other acids many have already been taken on basis of present quotations. Oxalic continues weak, owing to prolonged competition. A little better export inquiry is noted for sulphuric acid. Blue vitriol is quiet.

Quotations are per 100 lbs. as below, unless otherwise specified, for large lots in carboys or bulk (in tank cars), delivered in New York and vicinity:

Acetic, com'l 28%....$1.80	Oxalic, com'l.....5@5.25
Blue vitrol.....4.62½@4.75	Sulphuric, 50 deg., bulk ton. .....14.00@16.00
Muriatic, 18 deg..... 1.50	Sulphuric, 60 deg.....1.00
Muriatic, 20 deg.....1.62½	Sulphuric, 60 deg., bulk .....18.00@20.00
Muriatic, 22 deg.....1.75	Sulphuric, 66 deg.....1.20
Nitric, 36 deg.....4.00	Sulphuric, 66 deg. bulk. .....21.00@23.00
Nitric, 38 deg.....4.25	
Nitric, 40 deg.....4.50	
Nitric, 42 deg.....4.87½	

Brimstone.—Sales of best unmixed seconds from nearby steamer are reported at $23.50@$24 per ton, while shipments are worth $22.75@$23. Best thirds are $3 lower than seconds.

Pyrites.—Demand is improving, and prices are firm, though unchanged. A charter has been taken from Huelva, Spain to Savannah or Charleston at 9s. 6d. ($2.28), January sailing. Quotations, f. o. b. are: Mineral City, Va., lump ore, $4.90 per ton, and fines, 10c. per unit; Charlemont, Mass., lump, $5, and fines, $4.75. Spanish pyrites, 12@14c. per unit, delivered ex-ship New York and other Atlantic ports. Spanish pyrites contain from 46 to 51 per cent of sulphur; American, from 42 to 44 per cent.

Sulphate of Ammonia.—Gas liquor (24@25 per cent) is quoted to arrive at $2.82 1-2 per 100 lbs.

Nitrate of Soda.—Quiet. Few sales on spot were made at $1.91@$1.91 1-4 per 100 lbs. To arrive is quoted $1.92 1-2, and next year's shipments, $1.95. Arrivals at New York this week were *Loch Finals* with 21,986 bags, and *Cumbal*, 45,000 bags. At Boston the *Urd* was reported with 29,000 bags. Expected cargoes this year include *Capac*, 25,000 bags; *Australia*, 16,000 bags: *Cromarty*, 5,000 bags; *Cova*, 25,000 bags; *Ariel*, 9,500 bags, and *Cacique*, 28,000 bags. In January and February 4 ships are looked for with about 130,000 bags. On the coast the market is quiet but firm.

Concerning the Chilean market, Messrs. Jackson Brothers, of Valparaiso, write us under date of October 19, that transactions during the fortnight have been very limited, due to the scarcity of nitrate for this year's delivery and exporters showing no interest for next year's delivery at the high prices asked by producers. In 95 per cent, sales have been effected for October and November delivery at 6s. 9 1-2d.@6s. 11d. alongside; for January at 6s. 8d., and for February at 6s. 6 1-2d. alongside. In refined little or nothing has been done. The production in September is telegraphed as 2,215,000 qtls, making a total for the first 9 months of this year, 20,859,000 qtls. or say 2,656,000 qtls. less than in 1900 during the same period. We quote 95 per cent October-November, 6s. 11d.; December, 6s. 9 1-2d.: January, 6s. 8d.: February-March, 6s. 6d., and 96 per cent October-December, 6s.; January-March, 6s. 9 1-2d.; all ordinary terms, sellers. The price of 6s. 8 1-4d. per cwt. net cost and freight without purchasing commission. Reported sales for the fortnight ending October 19, are 96,000 qtls., and resales, 53,000 qtls.

Phosphates.—The foreign market is higher, owing to a better understanding between sellers of the various products. The Florida high grade rock people have advanced their c. i. f. quotations to 7d. per unit. Tennessee stuff is sympathetically stronger, but South Carolina rock has been offered at 4 1-2d. per unit for early shipment, owing to a low freight market.

At producing centers mining is active and sellers hold for firmer prices. In fact, at a recent meeting in Ocala, Fla., some of the larger interests advanced the f. o. b. price for high grade rock to $7.50.

Algerian rock (58@63 per cent) production next year has, it is reported, nearly all been contracted for, around 5 1-2d. per unit.

Liverpool. Nov. 13.

(Special Report of Joseph P. Brunner & Co.)

Trade in chemicals as regards fresh orders for prompt delivery has been quiet for this month, while at the same time quotations are well sustained.

Following are exports of bleaching powder and sodas for the month ending October 31, as per Board of Trade returns: Bleaching powder, total exports to all quarters including United States, 142,471 cwts.; shipment to United States alone, 89,619 cwts.; soda compounds, 131,585 cwts.; soda ash, 116,731 cwts.; caustic soda, 30,993 cwts.; bicarb. soda, 22,847 cwts.; soda crystals, 42,341 cwts.; saltcake and other sorts 23,680 cwts.; total exports soda compounds, 368,177 cwts.

The total exports as given above are the largest of any single month since March, 1900. As regards the shipments of bleaching powder to United States alone, those of last month are the heaviest of any month this year, with one exception of January last.

The exports of bleaching powder for the 16 months ending October 31, are still, however, considerably behind 1900; but the shipment of sodas only show a falling off of a shade over 2 1-2 per cent. as compared with the same period of last year, in spite of the light shipments during the first five months of this year, the leeway having been made up since May last.

Soda ash continues in steady demand at usual varying prices as to market. For tierces, the nearest spot range may be called about as follows: Leblanc ash, 48 per cent, £5 15s.@£6; 58 per cent, £6 2s. 6d.@£6 7s. 6d. per ton, net cash. Ammonia ash, 48 per cent, £4 10s.@£4 15s.; 58 per cent, £4 15s. @ £5 per ton net cash. Bags, 5s. per ton under price for tierces. Soda crystals meet with a fair amount of attention from buyers, and for barrels £3 7s. 6d. per ton, less 5 per cent is generally quoted, or 7s. less for bags, with special terms for certain export markets. Caustic soda continues quiet as regards fresh business, but spot quotations are about unchanged, as follows: 60 per cent. £9@£9 2s. 6d. per ton; 70 per cent. £10 2s. 6d.; 74 per cent, £10 10s; 76 per cent. £10 15s @ £11 per ton, net cash.

Bleaching powder is without special feature, and makers being fairly busy with deliveries on contracts, the spot price is about unchanged at £7 per ton net cash for hardwood packages, with special terms for certain export quarters. Chlorate of potash is firmer, makers being now pretty well sold for prompt delivery and also over 1902, and 3d. to 3¼d. is now nearest value for any position. Bicarbonate soda is selling to a fair extent at £6 15s. per ton, less 2½ per cent for the finest quality in 1 cwt. kegs; with usual allowances for larger packages; also special terms for a few favored markets.

Sulphate of ammonia is dearer at £11 5s.@ £11 7s. 6d. per ton, less 2½ per cent for good gray, 24 @25 per cent in double bags, f. o. b. here.

Nitrate of soda is rather quiet as regards spot demand, but holders are firm at £9 10s.@£9 12s. 6d. per ton, less 2½ per cent for double bags f. o. b. here, as to quantity and quality.

Messina, Sicily. Oct. 31.

(Special Report of Emil Fog & Sons.)

Brimstone.—Market ruled very quiet throughout this whole month. The Anglo-Sicilian Company has not made any alteration in prices. Dissidents' lots have been selling at somewhat lower prices, but the quantity was too small to impress the market.

Our foreign exchange continued to decline, hence sterling values are raised further.

The chief obstacle for actual business is the scarcity of steamers, which is likely to continue as long as return freights from the United States are so miserable; 8s. 6d. was paid to New York, against 6s. 3d. only a fortnight ago. This scarcity of tonnage produced a reduction in exports and an increase in stocks, which were about 50,000 tons at end of October in excess of last year.

Brimstone, it seems, will cease to be the great article of speculation of the past. Henceforward prices will be fixed in advance, by the Anglo-Sicilian Sulphur Company, and kept unaltered, adding only monthly the interests. The certainty that inflated prices will have the effect of curtailing consumption will prevent any excessive rise in prices. Let us hope so. We quote, per ton: Best unmixed seconds, 83s. 9d. ($20.10); best unmixed thirds, 73s. ($17.52); refined block (100 per cent) 85s. ($20.40); refined roll, in casks, 92s. ($22.08); sublimed flowers, pure, in bags, 104s. ($24.96); sublimed flowers, current, in bags, 95s. ($22.80).

Freights are 8s. 6d. ($2.04) to New York, 9s. 6d. ($2.28) to Boston, and 9s. ($2.16) to Baltimore and Philadelphia.

METAL MARKET.

New York. Nov. 29

GOLD AND SILVER.

Gold and Silver Exports and Imports.

At All United States Ports in October and Year.

Metal	October. 1900.	October. 1901.	Year. 1900.	Year. 1901.
Gold.				
Exports....	$441,962	$3,808,543	$53,046,883	$36,489,012
Imports....	10,731,375	5,493,864	50,720,485	40,893,906
Excess.....	I. $10,289,413	I. $1,685,421	E. $2,326,398	I. $4,404,894
Silver.				
Exports....	$6,103,354	$4,737,689	$53,605,245	$26,225,618
Imports....	3,031,804	3,070,516	33,302,234	25,551,660
Excess.....	E. $3,071,550	E. $1,667,573	E. $20,303,011	E. $673,958

These figures include the exports and imports at all United States ports, and are furnished by the Bureau of Statistics of the Treasury Department.

Gold and Silver Exports and Imports, New York.

For the week ending Nov. 27, 1901, and for years from January 1st, 1901, 1900, 1899 and 1898.

Period.	Gold. Exports.	Gold. Imports.	Silver. Exports.	Silver. Imports.	Total Excess Exports or Imports.
Week ...	$270,792	$8,042	$357,267	$5,843	E. $614,174
1901.....	41,718,367	4,449,265	28,324,736	3,357,639	E. 62,236,199
1900.....	36,659,688	10,088,218	36,128,926	4,454,672	E. 58,245,724
1899.....	11,732,386	13,794,628	27,669,502	3,554,837	E. 22,052,423
1898.....	8,433,594	96,853,233	32,172,703	3,008,125	I. 59,255,061

The gold exported this week went chiefly to France, and the silver to London. Imports were from Central and South America and the West Indies.

Financial Notes of the Week.

Business is still active, but with no special event to mark the week. No gold exports are noted thus far this week, but it is quite possible that some more may be made. As we expected, the shipments of the last two weeks have had very little effect upon the money market, for the reasons explained.

The statement of the United States Treasury on Wednesday, November 27, shows balances in excess of outstanding certificates as below, compared with the corresponding day last week:

	Nov. 20.	Nov. 27.	Changes.
Gold	$105,434,358	$106,064,740	I. $630,382
Silver	10,099,645	9,780,429	D. 319,216
Legal tenders.....	6,926,465	7,024,415	I. 97,950
Treas. Notes, etc....	61,598	66,766	I. 5,168
Totals.....	$122,522,066	$122,936,350	I. $414,284

Treasury deposits with national banks amounted to $114,262,376, showing a decrease of $6,677,575 over last week.

The statement of the New York banks, including the 63 banks represented in the Clearing House—for the week ending November 23—gives the following totals, comparison being made with the corresponding weeks in 1900 and 1899:

Loans and discounts...	$676,636,400	$792,720,100	$869,062,000
Deposits	737,958,000	851,391,300	932,957,500
Circulation	16,471,600	30,688,200	31,971,400
Specie	142,010,600	164,742,500	177,175,500
Legal tenders	49,131,100	60,383,600	70,550,800
Total reserve.....	$191,141,700	$225,126,100	$247,726,300
Legal requirements....	184,489,500	212,847,825	233,239,375
Balance surplus.....	$6,652,200	$12,278,275	$14,486,925

Changes for the week, this year were increases of $586,000 in specie, $515,400 in legal tenders, and $4,383,100 in surplus reserve: decreases of $13,504,400 in loans and discounts, $13,126,800 in deposits, and $10,200 in circulation.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars and comparison is made with the holdings at the corresponding date last year.

	1900. Gold.	1900. Silver.	1901. Gold.	1901. Silver.
N. Y. Ass'd..	$164,742,500	.....	$177,175,500	.....
England	159,289,455	.....	176,063,085	.....
France	461,927,360	222,861,295	482,484,440	220,442,235
Germany	137,965,000	70,195,000	152,450,000	78,525,000
Spain	69,185,000	81,620,000	70,290,000	84,775,000
Net'h'ds	24,385,000	27,590,000	28,709,000	29,910,500
Belgium	14,260,000	7,130,000	15,230,000	7,615,000
Italy	77,000,000	8,600,000	79,670,000	10,234,500
Russia	349,685,000	30,060,000	329,765,000	28,480,000

The returns of the Associated Banks of New York are of date November 23 and the others November 21, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver

separately, but the specie carried is chiefly gold. The Bank of England reports gold only.

The foreign merchandise trade of Great Britain for the ten months ending October 30 is valued by the Board of Trade returns as below:

	1900.	1901.
Imports	£427,646,786	£428,745,972
Exports	296,244,111	290,197,671
Excess, imports	£131,402,675	£138,548,301

This shows an increase of £7,145,626 in the balance of imports. The gold and silver movement is reported as follows:

	Imports.	Exports.		Excess.
Gold:				
1901	£18,707,469	£10,611,817	I.	£8,095,652
1900	22,494,739	13,565,900	I.	8,938,839
Silver:				
1901	9,614,312	9,941,088	E.	326,776
1900	10,704,917	11,258,900	E.	553,983

Of the silver imported this year, £8,138,070 is credited to the United States.

The silver market has collapsed. This is owing in a measure to dear money unfavorably affecting the Eastern exchanges; to absence of large continental buyers; and to forced sales by tired holders. The market closes uncertain.

The United States Assay Office, in New York, reports the receipt of 37,000 oz. silver during the week.

Shipments of silver from London to the East for the year up to November 14, are reported by Messrs. Pixley & Abell's circular as follows:

	1900.	1901.		Changes.
India	£5,633,022	£6,637,910	I.	£1,004,888
China	1,160,924	590,212	D.	570,712
The Straits	555,854	508,589	D.	472,265
Totals	£7,349,800	£7,736,711	I.	£386,911

Arrivals for the week, this year were £168,000 in bar silver from New York, £19,000 from Australia, and £10,000 from Chile; total, £197,000. Shipments were £120,000 in bar silver to Bombay, and £5,000 to Calcutta; total, £125,000.

Indian exchange continues steady, the demand for money in India being still good, while exports are large. The council bills offered in London were all taken at an average of 15.98d. per rupee. The demand for silver for India was moderate only.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars	$0.44	$0.46
Peruvian soles and Chilean pesos	.42	.45
Victoria sovereigns	4.85	4.88
Twenty francs	3.84	3.88
Twenty marks	4.73	4.85
Spanish 25 pesetas	4.78	4.82

UNITED STATES.

Articles. Long tons.	September. Imports.	September. Exports.	Nine months. Imports.	Nine months. Exports. Foreign.	Nine months. Exports. Domestic.
Ores and Metals.					
Antimony	181	...	1,354	...	...
Antimony ore	8	...	722	22	...
Copper	3,421	6,119	25,103	4,602	65,643
Copper ore, matte	9,038	1,975	66,046	7,788	10,673
Iron and Steel:					
Bars, rods	2,994	2,696	27,027	61	41,943
Billets, blooms	518	50	5,752	2	27,103
Hoops, bands	885	5	1,688	...	1,014
Pig iron	5,684	2,170	33,965	135	48,956
Nails and spikes	...	2,598	...	...	24,785
Rails	19	17,648	890	...	267,535
Scrap	2,082	1,153	15,002	3,331	10,672
Sheets, plates	606	732	3,593	81	26,989
Wire	122	7,831	2,384	27	61,525
Miscellaneous	39	4,709	321	13	40,932
Iron ore	115,618	11,435	724,076	...	49,401
Lead	10	1	129	22	2,109
Lead ore, bullion	5,079	7,146	76,797	69,503	...
Manganese ore, oxide	11,460	4	111,834	106	...
Nickel ore, matte	5	266	27,951	...	1,987
Quicksilver	...	33	...	...	264
Tin	2,697	49	25,405	828	...
Tin & black plates	8,515	28	50,644	125	416
Zinc	...	154	329	...	2,402
Zinc ore	...	2,188	...	...	29,286
Minerals.					
Asphalt	12,264	...	109,851	105	...
Brimstone	13,720	...	119,481	151	...
Cement	17,656	9,401	109,262	5,158	59,092
Coal, anthracite	...	153,192	...	7	1,607,415
Coal, bituminous	152,048	436,742	1,456,073	2,084	4,126,014
Coke	...	31,324	...	...	294,375
Copper sulphate	...	138	...	...	21,019
Graphite	835	...	11,213	3	...
Nitrate of soda	13,092	...	152,518	1,656	...
Phosphate rock	22,098	68,870	118,255	30	576,483
Pyrites	37,296	...	301,548	...	...
Salt	14,413	1,433	134,924	1,469	7,424

The figures for copper are those given by the Treasury Department. The statement made by Mr. John Stanton for the Associated Copper Companies will be found monthly in our metal market. These figures give the exports for September as 6,419; nine months, 68,110 tons.

Import Duties.

Metals.—The duties on metals under the present tariff law are as follows: Antimony, metal or regulus, ¾c. a lb. Lead 1½c. a lb. on lead ores; 2½c. a lb. on pigs, bars, etc., 2½c. on sheet pipe and manufactured forms. Nickels, 6c. a lb. Quicksilver, 7c. a lb. Spelter or zinc, 1½c. a lb. on pigs and bars, 2c. on sheets, etc. Copper, tin and platinum are free of duty.

Minerals.—Duties are: Asphalt, crude, $1.50 per ton, and refined $3 per ton. Coal, bituminous, 67c. long ton; coke, 20 ad. val. Cement, Roman Portland and hydraulic, in bulk, 8c. per 100 lbs. and in packages 7c. Copper sulphate, ½c. a lb. Salt in bulk, 8c. per 100 lbs., and in bags, etc., 12c. Brimstone, anthracite coal, graphite, phosphate rock, pyrites and nitrate of soda are free of duty.

Average Prices of Metals per lb., New York.

Month.	Copper. 1901.	Copper. 1900.	Tin. 1901.	Tin. 1900.	Lead. 1901.	Lead. 1900.	Spelter. 1901.	Spelter. 1900.
Jan.	16.25	15.58	26.51	27.07	4.35	4.68	4.13	4.65
Feb.	16.38	15.78	26.68	30.58	4.35	4.675	4.01	4.64
March	16.42	16.29	26.03	32.90	4.35	4.675	3.91	4.60
April	16.43	16.76	25.93	30.90	4.35	4.675	3.98	4.71
May	16.41	16.34	27.12	29.37	4.35	4.181	4.04	4.53
June	16.38	15.75	28.60	30.50	4.35	3.901	3.99	4.29
July	16.31	15.97	27.85	33.10	4.35	4.030	3.95	4.28
August	16.25	16.35	26.78	31.28	4.35	4.250	3.99	4.17
Sept.	16.25	16.44	25.31	29.42	4.35	4.350	4.08	4.11
October	16.25	16.37	26.62	28.54	4.35	4.350	4.23	4.15
Nov.	....	16.40	....	28.25	...	4.350	...	4.29
Dec.	....	16.31	....	28.94	...	4.350	...	4.25
Year	....	16.19	....	29.90	...	4.37	...	4.39

The prices given in the table for copper are the averages for electrolytic copper. The average price for Lake copper for the year 1900 was 16.52c.; for the month of January, 1901, it was 16.77c.; for February, 16.90c; for March, 16.94c.; for April, 16.94c.; for May, 16.94c.; for June, 16.90c.; for July, 16.61c.; for August, 16.50c.; for September, 16.54c.; for October, 16.60c.

Average Prices of Silver, per oz., Troy.

Month.	1901. London. Pence.	1901. N. Y. Cents.	1900. London Pence.	1900. N. Y. Cents.	1899. London. Pence.	1899. N. Y. Cents.
January	28.97	62.82	27.30	59.30	27.42	59.36
February	28.13	61.06	27.49	59.76	27.44	59.42
March	27.04	60.63	27.59	59.81	27.48	59.64
April	27.30	59.29	27.41	59.59	27.05	60.10
May	27.43	59.64	27.56	59.96	28.15	61.23
June	27.42	59.57	27.81	60.42	27.77	60.43
July	26.96	58.46	28.23	61.25	27.71	60.26
August	26.94	58.37	28.13	61.14	27.62	60.00
September	26.95	58.26	28.85	62.63	27.15	58.89
October	26.62	57.59	29.58	63.83	26.70	57.98
November	....	....	29.66	64.04	27.02	58.67
December	....	....	29.68	64.14	27.21	58.99
Year	....	....	28.27	61.33	27.44	59.58

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

OTHER METALS.

Daily Prices of Metals in New York.

November.	Sterling Exchange	Silver N. Y. Cts.	Silver London Pence.	Copper Lake Cts. per lb.	Copper Electrolytic per lb.	Copper London £ per ton.	Tin, cts. per lb.	Lead cts. per lb.	Spelter N.Y. cts. per lb.	Spelter St. L. cts. per lb.
22	4.87	56½	26	16½@16¾	16¼	66¼	29	4.32½@4.37½	4.27½@4.30	4.12½@4.15
23	4.87¼	56½	26	16½@16¾	16¼	....	29½	4.32½@4.37½	4.27½@4.30	4.12½@4.15
25	4.87	56	25⅞	16½@16¾	16¼	66¼	30½	4.32½@4.37½	4.27½@4.30	4.12½@4.15
26	4.87	55⅝	25⅝	16½@16¾	16¼	65¼	31½	4.32½@4.37½	4.30	4.15
27	4.87¼	54⅞	25⅜	16½@16¾	16¼	64½	33	4.32½@4.37½	4.30@4.32½	4.15@4.17½
28	.....	....	....	.....	....	....	.....	.....	.....	.....

London quotations are per long ton, (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars; the price of electrolytic cathodes, is usually 0.25c lower than these figures.

Copper.—Has again ruled very dull indeed. In view of the many conflicting rumors which have been circulated, especially on the Stock Exchange, consumers are confining their purchases to their most urgent and immediate wants. Quotations are more or less nominal at 16½@16¾c. for Lake; 16¼c. for electrolytic copper in cakes, wirebars and ingots, 16c. in cathodes; 15⅝@15¾c. for casting copper.

The market for standard copper in London which closed last Friday at £66 5s, opened firm on Monday at the same price, but experienced a smart decline on Tuesday, and the closing quotations on Wednesday are cabled as £64 10s.@£64 12s. 6d. for spot, £62 @£62 2s. 6d. for three months. It will be noticed that there is again a very large backwardation, amounting to £2 10s.

Refined and manufactured sorts we quote: English tough, £71 5s.@£71 15s.; best selected, £71 15s. @£72, 5s.; strong sheets, £80@£80, 5s.; Indian sheets, £77@£77 5s.; yellow metal, 6½@6⅝d.

Exports of copper from New York, Baltimore and Philadelphia for the current week are reported by our special correspondents as follows: To England, 343 tons; France, 200; Germany, 275; Holland, 219; Belgium, 30; Italy, 35; Japan, 11; Mexico, 6; total, 1,119 tons. Also 413 tons matte to England.

Imports were 75 tons copper from England, and 3,650 tons ore from Spain.

Imports of copper in all forms into Great Britain for the 10 months ending October 31, were as follows, in long tons; the totals given being the equivalent in long tons of fine copper:

	1900.	1901.	Changes.
Copper ores	88,813	80,044	D. 8,769
Matte and precipitate	73,174	76,258	I. 3,084
Fine copper	60,925	55,352	D. 5,573
Totals, fine copper	106,393	101,485	D. 4,908

Of the imports this year 824 tons of ore, 15,814 tons of matte and 15,538 tons of fine copper were from the United States; showing an increase of 8,964 tons matte and a decrease of 8,814 tons fine copper.

Tin.—The feature of the week has been the corner of spot tin, for which description 31½@33c. is said to have been paid on Wednesday. While there is no doubt that the country is practically bare of prompt supplies, there are quite heavy shipments on the way and the situation will probably be relieved within the next ten days. The closing quotations are 27@27¼ for early December; 26@26¼c. for late December; 25 3-4@26c. for January.

The higher values established on this side have now also caused a sharp advance in the London market. It closed last Friday at £114, opened on Monday at £115, and the closing quotations on Wednesday are cabled as £117 10s.@£117 12s., 6d., for spot, £109 10s.@£109 12s. 6d. for three months.

Imports of tin into Great Britain for the 10 months ending October 31, were, in long tons:

	1900.	1901.	Changes.
Straits	20,165	21,806	I. 1,641
Australia	2,415	2,568	I. 153
Other countries	4,295	5,052	I. 758
Totals	26,874	29,426	I. 2,552
Re-exports	15,720	17,816	I. 2,096
Balance	11,154	11,610	I. 456

For the other countries include Bolivia and the Dutch East Indies.

Lead.—Has been without any special feature. The meeting between the Western Miners and the American Smelting and Refining Company has so far not resulted in any understanding, and negotiations are still pending. The ruling quotations are unchanged at 4.25 @4.32½, St. Louis; 4.32½@4.37½c., New York.

The better tendency of the foreign market about which we reported last week, did not last very long, and quotations have again declined to £11 2s. 6d. for Spanish lead; £11 5s. for English lead.

Imports of lead into Great Britain for the 10 months ending October 31, are reported as below, in long tons:

	1900.	1901.	Changes.
United States	34,372	37,675	I. 3,303
Spain	71,610	79,097	I. 7,487
Australia	46,290	51,047	I. 4,757
Other countries	12,488	11,316	D. 1,172
Totals	164,760	179,135	I. 14,375

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

Spelter.—Continues to display considerable strength and we understand that large orders are being placed for delivery well into next year. Producers seem to be rather reluctant sellers owing to the higher prices asked for zinc ore. The ruling quotations at the close are 4.15@4.17½c., St. Louis; 4.30@4.32½c., New York.

Imports of spelter, or metallic zinc, into Great Britain for the 10 months ending October 31 were 56,502 long tons, against 58,400 tons for the corresponding period in 1900; showing a decrease of 1,898 tons this year.

Antimony.—Is unchanged. We quote Cookson's at 10c.; Hallett's, at 8¼@⅜c.; Hungarian, Italian, Japanese and United States Star at 8@⅛c.

Nickel.—The price continues firm at 50@60c. per lb., according to size and terms of order.

Platinum.—Consumption continues good and prices are strong. Ingot platinum in large lots brings $20@$21 per oz. in New York.

Chemical ware (crucibles and dishes), best hammered metal from store in large quantities, is worth 82c. per gram.

Quicksilver.—The nominal quotation in New York continues $51 per flask, but the metal can still be had for somewhat less, $49.50 for large orders. In San Francisco the quotations are $47@$48 per flask for domestic trade, and $43@$44 for export. The London quotation is £9 per flask, with the same price quoted from second hands.

Imports of quicksilver into Great Britain for the 10 months ending October 31 were 2,588,707 lbs., against 473,988 lbs. in the corresponding period last year. Exports were 1,670,643 lbs., against 1,566,097 lbs. in 1900; showing a balance of imports of 918,014 lbs. this year, against a balance of exports of 1,092,109 lbs. last year.

Minor Metals and Alloys.—Wholesale prices, f. o. b. works, are as follows:

Aluminum.	Per lb.		Per lb.
No. 1, 99% ingots	33@37c.	Ferro-Tungsten (37%)	28c
No. 2, 90% ingots	31@34c.	Magnesium	$2.75@$3
Rolled sheets	4c. up	Manganese (over 90%)	$1.00
Alum-brone	20@23c.	Mangan'e Cop. (20% Mn)	32c.
Nickel-alum	33@39c.	Mangan'e Cop (30% Mn)	38c.
Bismuth	$1.50	Molybdenum (Best)	$1.82
Chromium (over 90%)	1.00	Phosphorus	50c.
Copper, red oxide	50c.	American	70c.
Ferro-Molyb'um (50%)	$1.25	Sodium metal	50c.
Ferro-Titanium (10%)	90c.	Tungsten (Best	62c.
Ferro-Titanium (20%)	$1.10		

Variations in prices depend chiefly on the size of the order.

STOCK QUOTATIONS.

COLORADO SPRINGS, COLO.

Name of Company.	par val	Nov. 16. H.	Nov. 16. L.	Nov. 18. H.	Nov. 18. L.	Nov. 19. H.	Nov. 19. L.	Nov. 20. H.	Nov. 20. L.	Nov. 21. H.	Nov. 21. L.	Nov. 22. H.	Nov. 22. L.	Sales
Acacia	$1	.14½	.14	.16¾	.13	.14½	.13	.14	.13	.13¾	.12¾	.13	.12¾	5,000
Alamo	1	.14	.13	.13½	.13	.13¼	.12¾	.14	.13	.14	.13	.14	.13	12,000
Am. Con	1													
Anaconda	1	.28	.25¼	.28	.25	.28	.25	.30	.25½	.25¾	.25¼	.25¼	.25	3,000
Anchor	1	.01¾	.01¼	.02		.02								
Antelope	1	.01½		.02										
Aola	1	.03½	.03⅜	.03¼	.03½			.03½	.03¼	.03¼	.03⅜	.03¼	.03⅜	5,000
Argentum Jr	1	.08	.06	.08½	.06	.08	.05	.07½	.05	.07	.06	.07	.06	300
Banner	1	.01		.01		.01		.01						5,000
Battle Mt. C	1	.18	.17½	.18		.18	.15	.18	.17	.17		.18	.17	2,000
Black Bell	1	.09	.08½							.09	.08	.09	.08	
Blue Bell	1													
Buckhorn	1	.03½		.03½						.03½		.03¾	.01½	
But'fly Ter	1	.17	.13	.16	.15	.17	.15	.18	.16½	.20	.17¼	.23	.20¼	18,000
Cadillac	1			.01⅝		.01¾	.01	.01¾				.01½		
Cent'l Con	1	.08½	.08¼	.08¾		.08½	.08	.08½	.07	.08		.08½	.08	6,000
Champion	1	.03¾	.03⅝	.03¼	.03⅜	.03¾	.03⅝	.03⅝		.03⅝		.03⅜		2,000
Chicolo	1	.01½	.01⅛			.01⅝	.01⅛	.01		.01½				
C. K. & N	1	.02¼	.02⅛	.02⅛	.02	.02¼	.02⅛	.02⅛	.02	.02¼	.02	.02¼	.02⅛	19,000
C. C. Colum	1													
C. C. G. Ext	1	.07½		.07½		.08	.05	.06	.04½	.07½				
C. C. & Mn	1	.06¾		.06⅝		.06½	.04½	.04		.05¾		.05⅞	.04¾	
Cr'de & C. C	1	.08	.05	.06	.04½	.06	.04⅜	.05½	.04¼			.05	.04½	
C. C. Con	1	.09⅝	.09¼	.09¼	.09	.08¾	.08¼	.08½	.08¼	.09½	.08¾	.09½	.09	19,000
Dante	1	.04¾		.04⅝	.04⅜	.05	.04⅜	.04½	.04	.04⅜	.04¼	.04⅜	.04¼	7,000
Dr. Jack Pot	1	.54½	.53½	.54	.53	.53½	.52	.52	.51	.51		.52		10,200
Eclipse	1													
Elkton, Con	1	1.50⅛	1.50	1.52	1.51¾	1.49⅝	1.47½	1.49¼	1.48¼	1.49	1.47½	1.50	1.49½	54,352
El Paso, G	1	.76	.75	.76½	.76	.73	.72½	.72¾	.72¼	.75	.74	.74¼	.73¾	87,700
Fanny Rawlings	1	.20	.16	.20	.15	.20	.15	.17½	.15	.19	.15	.18½	.15	
Findley	1	.08½	.08	.08⅜	.08	.08¼	.08	.08	.07½	.08½	.07¾	.08½	.07⅜	8,000
Gold Dollar	1	.13⅜	.13¼	.12½	.12⅜	.13	.12¾	.13	.12¾	.13	.12¾	.12¾	.12⅝	65,000
Gold Cycle	1	.66	.64¾	.67	.66	.67	.62½	.67	.62	.65	.62	.62	.61¼	4,500
Gold Fleece	1	.40		.40				.40	.30			.38		500
Hayden, G	1													
Ingham, Con	½	.13¼	.13	.13¼	.12⅜	.13⅜	.12¾	.13	.12¾	.12¾	.12¼	.12¾	.12⅜	7,000
Ironclad	1	.05	.04	.04½		.04½				.04	.02	.04	.02½	
Isabella	1	.37½		.40	.38½	.37¼	.30¾	.37	.35	.39	.37	.38	.37	34,250
Jack Pot	1	.39		.39		.42	.39	.41	.35	.39		.39		500
Josephine	1													
Key West	1	.01⅜	.01	.01½		.01				.01½		.01½	.01	3,000
Lexington	1	.06⅝	.06¼	.06¾	.06⅛	.07	.06⅛	.07	.06⅛	.06¾	.06¼	.06⅞	.06¼	19,000
Magnet, R	1	.02		.02		.02	.01¾	.02	.01¾	.01¾	.01½			
Margaret	1			.01½										
Margery	1	.02	.01½	.02		.02	.01½	.02	.01½	.02	.01⅜	.02	.01½	
Midway	1	.04	.03⅝	.04	.03⅝	.03¾	.03⅜	.03⅝	.03⅛	.03¼	.03⅛	.03⅝	.03⅛	13,000
M. J. T	1	.01⅜	.01¼	.01⅝				.02	.01	.02	.01	.02	.01⅛	5,000
Mobile	1	.02⅜	.02¼	.02⅝	.02¼	.02⅜		.02¼	.02⅛	.02¼	.01⅞	.02⅛	.01¾	3,000
Moll Dwyer	1	.04¾	.04⅜	.04⅝	.04¼	.04¾	.04¼	.04¾	.04¼	.04⅜	.04¼	.04⅜	.04⅛	6,000
Mol. Gibson	1	.13		.12⅝	.12½	.15½	.14½	.16	.14	.17½	.15¾	.18	.16	2,750
Monarch	1	.03⅝	.03	.03⅝				.03½		.03¼		.03½		
Montreal	1	.03¼		.02⅝		.02½		.03¼		.03¼		.03¼		
Moon A'c'r	1	.28	.25	.28	.25	.27½	.25	.28	.25	.28	.24	.25½	.24⅛	1,500
Morn'g Star	1	.03½	.03¼	.03⅝	.03¼	.03⅝	.03¼	.03⅝	.03⅜	.03¾		.03⅝	.03¾	21,000
National	1	.02¾	.02½	.02⅝	.02¾	.02½		.02⅝	.02¼	.02½	.02⅜	.02⅜	.02⅛	10,000
Nellie, V	1		.04	.04	.03⅞	.04⅛		.04⅜	.04⅛	.04⅜	.04⅛	.04⅛	.04	12,000
New Haven	1	.05¾	.05	.05½	.05			.04⅞	.04⅜	.04⅜	.04⅜	.04¾	.04¼	6,000
Olive Branch	1	.03⅝	.02¾	.03	.02¾	.02⅝		.03	.02¾	.03	.02⅝	.02⅞	.02⅝	7,000
Oriole	1	.02	.01	.02	.01	.01		.02	.01	.02	.01	.02	.01	5,000
Orphan	1	.10	.07											
Pelican	1					.01		.01¼		.01				10,000
Pharmacist	1	.06¾	.05½	.06	.05	.06	.05½	.04	.03	.05½	.05	.05½		4,500
Pilgrim	1	.04	.03	.03½		.04		.04	.03	.04		.04	.03½	5,000
Pinnacle	1	.09	.08¾			.09	.08¾	.08½	.08¾	.09	.08	.09	.08	8,500
Pointer	1	.05⅞	.05¾	.05¾	.05	.05⅞	.05½	.05½	.05¼	.05¼	.05½	.06	.05¾	14,000
Portland	1	2.90		3.00	2.90	3.03	2.95	2.96	2.90	3.00	2.90	3.00	2.83½	1,800
Prince Alb	1	.04	.03⅝	.03⅞	.03⅝	.04	.03⅝	.03¾	.03½	.03½	.03	.03¾	.02¼	7,000
Princess	1	.03½	.03	.03	.02	.02¼				.02⅜	.02¼	.03⅜	.02¼	6,000
Progress	1	.04	.03	.04	.03	.04½				.04		.04	.03½	
Republic	1	.04½	.04	.03		.04½	.03¾	.04	.03⅝	.04	.03¾	.04	.03⅝	16,000
Rob. Burns	1	.02⅜	.02½	.03	.02½	.02¼				.02⅜	.02⅛	.02¼	.02	5,000
Rose Maud	1	.06⅞	.06¾	.07½	.07⅜	.06¾	.06⅜	.06⅝	.06⅜	.06⅝	.06¾	.06¾	.06¾	2,500
Rose Nichl	1	.06¾	.05⅝	.05¾		.06¼	.05	.06	.05¼	.06	.05¼	.05½	.05¼	2,000
Silver Gold	1	.01⅜												
Uncle Sam	1	.02⅜		.01½		.02½	.02	.02½		.02½		.02½		1,000
Vindicator	1	1.19		1.24	1.20	1.23¾	1.20	1.23¾	1.12	1.24	1.22	1.24	1.23	2,400
Va. M	1	.04⅞										.03		
Work	1	.11¼	.10¾	.10¾	.10½	.10⅝	.10⅜	.10½	.10	.10	.09⅝	.09½	.09	8,000

Total sales 644,152 shares.

Colorado Springs *By Telegraph*..

Name of Company.	par val	Nov. 20. H.	Nov. 20. L.	Nov. 21. H.	Nov. 21. L.	Nov. 22. H.	Nov. 22. L.	Nov. 23. H.	Nov. 23. L.	Nov. 25. H.	Nov. 25. L.	Nov. 26. H.	Nov. 26. L.
Acacia	$1	.13	.12	.13¼	.12¾	.14	.12¾	.13½	.13	.14¼	.13½	.14	.13¼
Almo	1	.14	.13	.14	.13	.14	.13	.14	.13	.14	.12⅞	.13½	.12⅞
Anaconda	1	.30	.25½	.25¾	.25¼	.25¼	.25	.27½	.25½	.28	.25½	.25½	.25
Argentum	1	.07½	.05	.07	.06	.07	.06	.07	.05	.07	.05½	.06¼	.05½
Battle Mt	1	.18	.17	.18	.17	.18	.17	.18	.17	.18	.16	.18	.16
Butterfly Ter	1	.18	.16½	.20	.17⅞	.23	.20⅛	.25	.20	.22	.20	.25	.20½
Cripple Creek Con	1	.08¼	.08¼	.09¼	.08¾	.09½	.09	.09½	.09	.09½	.08½	.08¾	.08½
Dr. Jack Pot	1	.52	.51	.52	.51	.53	.52	.53¾	.53	.54¾	.54	.54⅞	.52
El Paso	1	.72⅛	.72¾	.75	.74	.74⅛	.73¾	.74⅛	.73⅞	.72¾	.72¼	.73	.72¾
Elkton, Con	1	1.49¼	1.48½	1.49	1.47¼	1.50	1.49½	1.49	1.48¼	1.50½	1.55½	1.57¾	1.57⅛
Fanny Rawlings	1	.72⅛	.72¾	.01		.18½	.15	.18	.15	.17½	.15	.16	.15
Finley	1	.08	.07½	.08½	.07¾	.08¾	.07¾	.08¼	.07¾	.08¾	.07½	.08¼	.07¾
Gold Dollar	1	.13	.12¾	.13	.12¾	.12¾	.12⅝	.12⅝	.12¼	.12¼	.12⅜	.12½	.12¼
Gold King	1	.05	.50	.50	.50	.50	.40	.50	.50	.95	.40	.90	.50
Golden Cycle	1	.67	.62	.65	.62	.62	.61¼	.62	.60	.62	.61¼	.62	.60
Golden Fleece	1	.40	.30	.38	.30	.38	.35	.39	.35	.35	.20	.35	.20
Hart	1	.07	.05	.06	.05	.06	.05	.07	.05	.07	.04	.06	.04
Ingham, Con	1	.13	.12¾	.12¾	.12¼	.12¾	.12⅝	.13¼	.12⅝	.13⅜	.13	.13½	.12⅞
Isabella	1	.37	.35	.39	.37	.38	.37	.37¼	.37	.36	.35	.36¾	.36
Jack Pot	1	.41	.35	.41	.39	.41	.39	.41	.39	.41	.39	.41	.39
Keystone	1	.08	.07	.08	.07⅜	.08	.07⅜	.08	.07⅜	.07⅜	.07	.08	.07
Last Dollar	1	.65	.60	.60	.50	.60	.50	.60	.50	.55	.45	.60	.50
Lexington	1	.07	.06¼	.06¾	.06¾	.06¾	.06¾	.07¼	.07	.07	.06¾	.07	.06¾
Mobile Gibson	1	.16	.14	.17⅛	.15¾	.18	.16	.18¾	.16	.17¼	.16	.17	.16
Moon Anchor	1	.28	.25	.28	.24	.25½	.24½	.28	.24	.27	.24	.27⅛	.24
Nuggett	1	.17	.15	.15	.13	.16	.15	.16½	.15	.16½	.15½	.16¼	.15
Orphan	1												
Pharmacist	1	.05¾	.05	.05¼	.05¼	.05¾	.05½	.06¼	.06	.06	.05½	.06⅛	.05¼
Pinnacle	1	.08½	.08¾	.09	.08	.09	.08	.08½	.08	.08¾	.08	.08½	.08
Portland	1	2.96	2.90	3.00	2.90	3.00	2.83½	2.90	2.84	2.88	2.87½	2.93	2.88
Vindicator, Con	1	1.23¾	1.21½	1.24	1.22	1.24	1.23	1.24	1.20	1.24	1.16	1.24	1.15
Work	1	.10¼	.10	.10	.09¾	.09¼	.09	.09½	.09	.09¾	.09½	.09¼	.09⅝

MONTREAL, CANADA. Nov. 24.

Name of Company.	par val	H.	L.	Sales	Nome of Company.	par val	H.	L.	Sales
Big Three	$1	.01¼			Montreal-London	$0.24	.02¼	.01½	
California	1	.04½	.04		Noble Five	1			
Can. Gold Fields	0.10	.04¾			Novelty	1	.01¼	.00½	
Deer Trail Con	1	.03½	.02¼		North Star		.27	.22	
Evening Star	1	.04	.02		Payne	1	.14	.12½	1,500
Golden Star	1	.04¼	.03		Rambler-Cariboo	1			
Gold Hills Dev	1	.01½			Republic Con	1	.04¾	.02½	
Knob Hill	1				Slocan-Sovereign	1	.03	.02	
Monte Christo	1	.02			Virtue	1	.23½	.22½	1,000
Montreal, G. F	1	.03½			War Eagle	1	.15		

LONDON. Nov. 16.

Name and Country of Company	Authorized Capital.	Par value.	Last dividend. Amt.	Last dividend. Date	Quotations. Buyers.	Quotations. Sellers.
Alaska Goldfields, g., Alaska	£300,000	£. s. d. 1 0 0	s. d. 2 3	Jan., 1901	£. s. d. 10 0	£. s. d. 15 0
Alasks-Treadwell, g., Alaska	1,000,000	5 0 0	1 6	Oct., 1901	3 17 6	4 2 6
Anaconda, c. s., Montana	6,000,000	5 0 0	8 2	Oct., 1901	7 0 0	7 2 6
Copiapo, c., Chile	200,000	2 0 0	1 6	July, 1900	2 10 0	2 15 0
De Lamar, g. s., Idaho	400,000	1 0 0	1 0	May, 1901	5 0	6 0
El Oro, g., Mexico	1,000,000	1 0 0	1 3	July, 1901	1 6 3	1 8 9
Enterprise, g., British Col	200,000	1 0 0			13 9	16 3
Frontino & Bolivia, g., Columbia	140,000	1 0 0	3 0	July, 1901	1 0 0	1 2 6
Hall, Mg. & Sn., c. s., British Col	325,000	1 0 0			8 6	9 0 6
Le Roi, g., British Col	1,000,000	5 0 0	5 0	Nov., 1899	5 7 6	5 12 4
Le Roi No. 2, g., British Col	120,000	5 0 0	5 0	July, 1901	2 7 6	2 10 0
Lillie, g., Colorado	250,000	1 0 0	2½	April, 1900	1 3	3 9
Montana, g. s., Montana	660,000	1 0 0	6	April, 1899	4 0	4 6
Mountain Copper, California	1,250,000	5 0 0	5 0	Oct., 1901	4 0 0	4 5 0
Stratton's Independence, Colorado	1,100,000	1 0 0	1 0	Oct., 1901	1 0 0	1 2 6
St. John del Rev., g., Brazil	600,000	1 0 0	1 0	June, 1901	19 6	1 0 6
Utah Con., g., (High. Boy), Utah	300,000	1 0 0	5 0	May, 1901	4 10 0	5 0 0
Velvet, g., British Col	100,000	1 0 0			7 6	12 6
Ymir, g., British Col	200,000	1 0 0	1 0	Nov., 1901	2 0 0	2 2 6
European:						
Lineras, l., Spain	45,000	3 0 0	7 0	March, 1901	3 0 0	4 0 0
Mason & Barry, c., sul., Port'g'l	420,000	1 0 0	12 6	May, 1901	3 7 6	3 12 6
*Rio Tinto, c., Spain	1,625,000	5 0 0	£1 15s	Nov., 1901	45 0 0	45 5 0
*Rio Tinto, pref., Sprin	1,625,000	5 0 0	2s 6d	Nov., 1901	6 0 0	6 5 0
Tharsis, c., Spain	1,250,000	2 0 0	12 0	May, 1900	5 17 6	6 2 6
Australia and New Zealand:						
Assoc. Gold Mines, W. Australia	500,000	1 0 0	1 6	Jan., 1900	2 10 0	2 11 3
Br'ken Hill Pr'p., s., N. S. Wales	384,000	8 0	1 0	Nov., 1901	1 15 0	1 16 3
*Great Bo'd'r Pr'p., W. Australia	175,000	2 0	6	Sept., 1901	18 9	19 3
Hannan's Brownhill, g., W. Australia	140,000	1 0 0	7 6	Oct., 1900	3 7 6	3 10 0
Ivanh'e Gold C'p., W. Australia	1,000,000	5 0 0	4 0	Oct., 1901	8 11 3	8 13 9
Kalgurlie, g., W. Australia	120,000	1 0 0	rts.	Oct., 1899	3 10 0	3 12 6
L'ke Vi'w Cons., g., W. Australia	250,000	1 0 0	5 0	Oct., 1901	6 13 9	6 16 3
*Mt. Lyell M. E. R. L., c., Tasmia	900,000	3 0 0	2 6	Oct., 1901	3 18 9	4 1 3
Mt. Morgan, g., Queensland	1,000,000	1 0 0	6	Nov., 1901	4 10 0	4 12 6
Waihi, g., New Zealand	330,000	1 0 0	2 6	Dec., 1901	5 15 0	5 17 6
Indian:						
Champion Reef, g., Colar Fields	234,169	10 0	4 0	Sept., 1901	5 12 6	5 15 0
Mysore Gold, Colar Fields	265,000	10 0	4 0	Nov., 1901	5 16 3	5 18 9
Nundyroog, g., Colar Fields	242,000	10 0	1 6	Nov., 1901	2 0 0	2 2 6
Ooregum, g., Colar Fields	200,000	10 0	1 6	Dec., 1901	2 12 6	2 15 0
Ooregum, pref., g., Colar Fields	240,000	10 0	1 6	Dec., 1901	3 0 0	3 2 6
African:						
British S. Africa, ch'd S. Africa	5,000,000	1 0 0	rts.	May, 1899	2 10 0	2 11 3
Cape Copper, S. Africa	600,000	2 0 0	5 0	July, 1901	5 0 0	5 5 0
Cape Copper, pref., S. Africa	150,000	2 0 0	5 0	July, 1901	4 17 6	5 2 6
City and Sub'n (New), g., Transvaal	1,390,000	4 0 0	3 0	Aug., 1899	5 16 3	5 18 9
Crown Reef, g., Transvaal	120,000	1 0 0	18 0	Nov., 1899	14 0 0	14 5 0
De Beers Con., d., Cape Colony	3,950,000	5 0 0	£1	Sept., 1901	38 15 0	38 17 6
Ferreria g., Transvaal	90,000	1 0 0	3 0	Aug., 1899	19 5 0	19 15 0
Geldenhuis Est., g. Transvaal	200,000	1 0 0	10 0	Aug., 1899	5 17 6	6 2 6
Henry Nourse, g., Transvaal	125,000	1 0 0	10 0	Aug., 1899	7 17 6	8 2 6
Jagersfontein, d., Orange F. S.	1,000,000	5 0 0	6 0	Dec., 1900	21 5 0	21 10 0
Joh'n'b'g Con. Invet., S. Africa	2,750,000	1 0 0	2 0	Nov., 1899	2 0 0	2 2 6
Jubilee, g., Transvaal	50,000	1 0 0	5 0	Aug., 1899	5 5 0	5 10 0
Langlaagte Est., g., Transvaal	470,000	1 0 0	3 0	Sept., 1899	3 0 0	3 2 6
May Con., g., Transvaal	200,000	1 0 0	0 6	Aug., 1899	4 2 6	4 5 0
Meyer & Charlton, g., Transvaal	100,000	1 0 0	8 0	July, 1899	5 2 6	5 7 6
Namaqua, c., Cape Colony	200,000	2 0 0	8 0	June, 1901	3 17 6	4 2 6
Primrose (New), g., Transvaal	300,000	1 0 0	6 0	Aug., 1899	3 16 3	3 18 9
Rand Mines, g., S. Africa	1,795,956	5 0	15 0	Aug., 1899	10 0 0	10 1 3
Robinson, g., Transvaal	2,750,000	5 0 0	8 0	Aug., 1899	9 7 6	9 10 0
Sheba, g., Taansvaal	1,100,000	1 0 0	0 6	July, 1899	17 6	18 9
Sim. & Jack Prp., g., Transvaal	5,000,000	5 0 0	4 0	July, 1899	5 18 9	6 1 3
Wolhuter, g., Transvaal	860,000	4 0 0	2 0	Feb., 1899	3 17 6	4 2 6

c.—Copper. d.—Diamonds. g.—Gold. l.—Lead. s.—Silver. *Ex-dividend.

PARIS. Nov. 7.

Name of Company.	Country.	Product.	Capital Stock.	Par value.	Latest divs.	Prices. Opening.	Prices. Closing
			Francs.	Fr.	Fr.	Fr.	Fr.
Acieries de Creusot	France	Steel mfrs	27,000,000	2,000	85.00	1,600.00	1,646.00
" " Firminy	"	"	3,000,000	500	200.00	2,210.00	2,325.00
" " Huta-Bank	Russia	Iron and Steel		500		3,110.00	3,075.00
" " la Marine	France	Steel mfrs	20,000,000	500	65.00	1,230.00	1,305.00
Anzin	"	Coal			320.00	5,295.00	5,300.00
Boleo	Lower Cal	Copper		500	176.00	1,940.00	1,970.00
Briansk	Russia	Coal and Iron		500		414.00	385.00
Champ d'Or	S. Africa	Gold	3,375,000	25	3.75	25.75	25.75
Courrieres	France	Coal	600,000	300	90.00	2,245.00	2,300.00
Dombrowa	Russia	"		500	75.00		
Dourgee	France	"	12,000,000	500	10.00	24,700.00	24,700.00
Dynamite Centrale	"	Explosives		500	19.00	554.00	555.00
Escombrera-Bleyberg	Spain	Lead		500	50.00	745.00	735.00
Fraser River	Brit. Col'mb	Gold	250,000	25		4.75	4.00
Huanchaca	Bolivia	Silver	40,000,000	125	5.00	90.25	90.25
Laurium	Greece	Zinc and Lead	16,300,000	500	25.00	355.00	350.00
Malfidano	Italy	Zinc	12,500,000	500	12.50	410.00	400.00
Metaux, Cie. Fran. de	France	Metal dealers	25,000,000	500	22.50	410.00	383.00
Mokta-el-Hadid	Algeria	Iron	18,312,500	500	35.00	802.00	780.00
Napthe Baku	Russia	Petroleum				393.00	389.00
Napthe Nobel	"	"				499.00	490.00
" " parts	"	"				9,680.00	10,000.00
Nickel	N. Caled'nia	Nickel	10,000,000	250	20.00	485.00	520.00
Penarroya	Spain	Coal, etc		500	55.00	1,060.00	1,070.00
Rebecca	Colo'do, U. S.	Gold	5,000,000	25		1.25	1.25
Salines de l'Est	France	Salt		500	6.00	235.00	230.00
Salines du Midi	"	"		500	40.00	895.00	895.00
Vielle Montagne	Belgium	Zinc	9,000,000	80	30.00	572.00	565.00

TORONTO, ONT.

NAME OF COMPANY	Par val.	Nov. 19. H	Nov. 19. L	Nov. 20. H	Nov. 20. L	Nov. 21. H	Nov. 21. L	Nov. 22. H	Nov. 22. L	Nov. 23. H	Nov. 23. L	Nov. 25. H	Nov. 25. L	Sales
Ontario:														
Golden Star	1	.04⅝	.04	.04½	.03¾	.04	.03½	.04¼	.03½	.04¼	.03½	..	..	
British Col	1											..	..	
Cariboo McK	1	.16	.13½	.15	.13	.16	.13	.16	.13	.15	.11	..	..	
Center Star	1	.31	.25	.30	.25	.31	.27	.31½	.30	.36	.35	..	..	500
Crows, N. C	25	78.00	78.00	80.00	75.00	78.00	74.00	78.00	74.00	77.00	75.00	..	..	
Deer Trail	1	.02½	.02¼	.02¾	.02¼	.03	.02½	.02¾	.02¼	.03	.02½	..	..	22,025
Fairview	1	.04	.03	.04	.03¼	.04½	.03¾	.05	.03	.05	.03½	..	..	
Morrison	1	..	..	.03	..	.03	..	.03	..	..	..	..	..	
Noble Five	1	..	..	..	..	..	..	..	..	..	..	..	..	
North Star	1	.26½	.24½	.26	.23	.25	.24¼	.28	.24½	.28	.24	..	..	1,250
Payne	1	.15	.12	.14	.12½	.15	.12	.15	.12	.16	.13	..	..	600
Rambler	1	.52	.48	.53	.48	.52	.49½	.53	.50	.53	.49	..	..	1,000
Republic	1	.04½	.03¾	.04¼	.03½	.04	.03	.04	.03	.04	.03	..	..	
Virtue	1	.23	.20	.23	.19	.23	.20	.23	.20	.23	.20	..	..	
War Eagle Con	1	.12	.07	.11	.05	.11	.10	.12	.10	.12	.10	..	..	
Winnipeg	1	.07	.04	.07	.04	.07	.04	.06	.04	.06	.03½	..	..	
Wonderful	1	.03	..	.03	..	.02½	..	.02½	..	.02½	..	..	..	
Can. G. F. S.	1	.04¼	.04	.04½	.03¾	.04¼	.03¾	.04¼	.04	.04¼	.03¾	..	..	3,950

Total Sales 30,225 shares.

STOCK QUOTATIONS.

NEW YORK.

Company and Location.	par val	Nov. 20. H.	Nov. 20. L.	Nov. 21. H.	Nov. 21. L.	Nov. 22. H.	Nov. 22. L.	Nov. 23. H.	Nov. 23. L.	Nov. 25. H.	Nov. 25. L.	Nov. 26. H.	Nov. 26. L.	Sales
Alamo, Colo.	$1											14		2,000
Amalgamated C., Mont	100	86.88	86.25	86.50	85.00	87.25	85.63	86.75	83.00	85.50	79.75	80.75	78.00	441317
Anaconda C., Mont.	25	34.75	34.50	34.50		35.38	34.88	34.50	34.00	34.25	33.50	33.75	32.75	13,920
Anaconda Gold, Colo.	5					.24								200
Argentum Jun.												.07½		500
Best & Belcher, Nev.	2													
Breece, Colo.	25													
Brunswick, Cal.	1													
Comstock T., Nev.	100					.03½								
Comstock Bonds, Nev.	100	.06												
Con. Cal. & Va., Nev.	2½			1.60		1.70		1.70		1.70		1.70	1.65	950
Crescent, Colo.	10													350
Cripple Cr. Con., Colo.	1			.03				.08						2,500
Elkton, Colo.	1			1.45		1.45		1.45				1.50		500
Gold Dollar, Colo.	1							.10						1,000
Gould & Curry, Nev.	3							.07						1,000
Hale & Norcross, Nev.	3			.16						.20		.18		
Horn Silver, Utah.	25													
Iron Silver, Colo.	20					.04		.63		.63				850
Isabella, Colo.	1			.39						.39				500
Justice, Nev.	1			.02										200
Little Chief, Colo.	1													
Mexican, Nev.	3			.19										200
Mollie Gibson, Colo.	3			.20		.22						.20		1,400
Ontario, Utah.	100			10.00		10.25		10.50		10.50	10.00			510
Ophir, Nev.	3									.80				600
Phoenix, Ariz.	1			.08						.09				400
Portland, Colo.	1													
Potosi, Nev.	3			.03										200
Quicksilver, Cal.	100					4.50	4.00	4.75	4.25	4.50	4.35	4.40		4,400
Quicksilver pf., Colo.	100							10.50		9.75				240
Sierra, Nev.	3			10										200
Standard Con., Cal.	10			3.95		3.90				3.90		3.95		800
Syndicate, Cal.	1													
Union Copper, N. C.	10											.05⅝	.05⅜	1,500
Work, Colo.	1			.12				.11						8,000

Coal and Industrial Stocks.

Am. Agr. Chem., U.S.	100	24	21	24	21	24	21	24	21	24	21	22¾	22½	200
Am. Agr. Chem. pf, U.S.	100	25	81	85	81	85	81	85	81	85	81	82		100
Am. Car & Fdy., U.S.	100	29½	28⅝	29		29½	29	29¼	29	30	29¼	29½	29	78,765
Am. Car & Fdy. pf, U.S.	100	85	84½	85		85½	84¾	85⅝	85	86	85½	85⅞	85⅝	6,146
Am. Sm. & Ref., U.S.	100	47⅞	46¾	47¾	46	47⅜	47	47¼	45¾	47	46	45½	45½	17,980
Am. Sm. & Ref. pf, U.S.	100	117⅜		98¾	98	99	98½			98¾	98½	97⅜	97	1,720
Col. Fuel & I., Colo.	100	92		91½		93	92	93½	93	92½	92¼	92		2,220
Col. & H. C. & I., Colo.	100	15	14⅜	14⅜		15		16	15¼	19	16½	19½	18½	8,200
Int'l S. Pump, U.S.	100	48		48¾		48¼		48¼		48¾		48½	48	612
Int'l S. Pump pf, U.S.	100	88		87½						87		88	87½	450
Mong. R. Coal, Pa.	100	13⅜	13⅜	13⅛	12¼	13¼	13	13⅛	13					2,000
Mong. R. Coal pf, Pa.	100	45½		46⅜	46¾	46½	46							151
National Lead, U.S.	100	19		19¼		19½	19¼			19½	18⅞	19½	18⅞	300
National Lead pf, U.S.	100					88½	86			88¼	87			
National Salt, U.S.	100	33	29½	33	29½	31	30	31	30	31	30½	31	30⅝	
National Salt pf, U.S.	100	69	63¾	69	63¾	68	63¼	68	63¾	68	63¼	63¼		190
Pittsburg Coal, Pa.	100	27½	27¼	27½	27¼	27⅝	27½	28½	28¼					2.410
Pittsburg Coal pf, Pa.	100	92¼	92	92¼	91⅞	92½	92	92						988
*Pressed Steel Car, Pa.	100	43¾	43¼	43⅞		44⅜		44½	43	44	43¼	43¼	42¼	3.070
Republic I & S., U.S.	100	15⅜	15½	15⅝		16¼	15¾	16¾	15⅞	16½	16	16½	16	9.400
Republic I. & S. pf, U.S.	100	68		68		68⅞	68¼	69	68½	70¼	69	70	69½	5.300
Sloss-Shef S. & I., Ala.	100	30½		31		31¼	31	31¾	31¼	32	31			1.400
Sloss-Shef S. & I. pf, Ala.	100			80¼		82	81½			83	81			365
Standard Oil, U.S.	100	700	699	700	695	700	695	700	695	700	695	700	695	
Tenn. C. I. & R. R., Ala.	100	63½	62½	63¾	62¼	64⅝	63¼	65¾	64½	66⅛	65	65½	64¼	28.200
U.S. Steel Corp., U.S.	100	42⅜	42	42½	42	43	42⅜	43⅛	42½	42⅞	42⅜	42⅝	42⅜	65.580
U.S. Steel Corp. pf, U.S.	100	92⅜	92	92½	91⅞	93	92½	93	92⅝	93⅛	92½	92¾	92¼	57.134
Va.-Car Chem., U.S.	100	62		*62	61	61½		63	61	63	61	63	61⅜	200
Va.-Car Chem. pf, U.S.	100	123½		*123	121½	123	121½	123	121½	123	121½	125	121½	

Total sales *Ex. dividend.

PHILADELPHIA, PA. §

Name and Location of Company.	par val	Nov. 20. H.	Nov. 20. L.	Nov. 21. H.	Nov. 21. L.	Nov. 22. H.	Nov. 22. L.	Nov. 23. H.	Nov. 23. L.	Nov. 25. H.	Nov. 25. L.	Nov. 26. H.	Nov. 26. L.	Sales
Am. Alkali	...	.50		.50		.50		.50				.50		2,800
Am. Cement	...	6.00		6.50	6.25			6 50				6.25		558
Beth. Iron, Pa.	...													
Beth. Steel, Pa.	...													
Cambria Iron, Pa.	...	47.50	47.25	47.50		47.25				47.50		48.00		153
Cambria Steel, Pa.	...	25.75	25.50	25.75	25.50	26.00	25.75	25.75		25.75	25.50	25.63	25.13	8,283
Susq. S. & S., Pa.	...	2.00	1.88			1.88		1.88				2.00		625
United Gas I., Pa.	...	115¾	115¼	117¼	115¼	119¼	117¼	119½	117¼	118½	118⅜	118	117¼	3,499

§Reported by Townsend, Whelen & Co., 309 Walnut St., Philadelphia, Pa. Total sales 15,918 shares.

MEXICO. Nov. 16.

Name of Company.	Shares	Last div'd	Prices. Bid.	Ask.
Durango:				
Ca. Min. de Penoles.	2,500	50.00	3,700	3,900
Augustias, Pozos ...	2,400	5.00	70	75
Guananjuato:				
Cinco Senores y An., aviada	2,000	15.00	230	235
Cinco Senores y An., aviada.	400		170	186
Providencia, San Juan de la Luz.....	6,000	2.00	190	200
Guerrero:				
Garduno y Anexas..	7,200		30	50
Hidalgo:				
Amistad y Concordia.	9,600	1.56	45	46
Carmen, aviada.....	1,100		120	140
Ca. Real del Monte.	2,554		550	750
El Encino, aviador..	1,120		40	50
Guadalupe Fresnillo y Annexas	1,000		190	195
La Blanca, aviada...	1,536		295	305
La Blanco, aviada ..	768		220	240
Maravillas y An., aviador.	1,680		165	180
Maravillas el Lobo..	1,000		300	400
Palma y An., aviador.....	1,800		15	25
Sta. Gertrudis y An., aviador, ...	9,600		4	5
Sta. Gertrudis y An., aviador 28,800		0.50	52	53
Santo Tomas Apostol aviador	5,100		10	11
San Rafael y An., aviada	1,200	8.00	405	415
San Rafael y An., aviada.	1,200	8.00	360	380
Soledad, aviada...	960	5.00	290	300
Sorpresa, aviada ..	960	5.00	285	300
Mexico:				
Alacran	2,400		40	50
La Esperanza (El Oro)	3,000	10.00	795	850
Socavon de S. Fern..	2,500		50	60
Michoacan:				
Luz de Borda, aviador.	3,000		10	13
Luz de Borda, aviada	1,000		7½	10
San Luis Potosi:				
Concepcion y An....	3,000		115	130
El Barreno, aviador.	2,000	2.00	43	46
Sta. Maria de la Pa.	2,400	15.00	540	555
Santa Fe	2,400		20	30
San Diego y Anexas.	2,400	4.00	125	130
Zacatecas:				
Candelaria y Pinos..	2,500		400	415
San Carlos y Annexas	2,500	15.00	410	425
Sta. Maria de Guad..	2,500		330	335
Miscellaneous:				
Bartolome de Medina	2,000	2.00	45	50
Guadalupe Hacienda.	10,000	2.00	190	195
La Luz Hac. (Pachuca)	6,000		44	45
La Reina (Chihuahua)	192		2,500	3,500
Naica (Chihuahua)..	100		2,450	2,550
Natividad (Oaxaca) aviador	1,800	4.00	400	500
National (Oaxaca) aviador	1,800	4.00	400	500
San Francisco Hac...	6,000	1.00	62	64
Santa Ana Huantla Morelos	4,000		50	70
Union Hacienda	3,000	5.00	140	150

BOSTON, MASS.

Name of Company.	par val	Shares listed.	Nov. 20. H.	Nov. 20. L.	Nov. 21. H.	Nov. 21. L.	Nov. 22. H.	Nov. 22. L.	Nov. 23. H.	Nov. 23. L.	Nov. 25. H.	Nov. 25. L.	Nov. 26. H.	Nov. 26. L.	Sales.
Adventure Con. c..	$25	100,000	22.00	.....	24.00	22.50	23.25	.....	23.38	22.75	22.75	22.50	22.50	22.00	1,855
Aetna Con., q.....	5	100,000													
Allouez, c.....	25	80,000									4.75		4.88		40
Amalgamated, c...	100	1,550,000	87.00	86.25	86.25	85.25	87.00	85.75	86.38	83.00	85.00	79.75	80.63	77.75	67,298
Am. Gold Dreg....	5	90,000			3.00	2.00									1,450
Am. Z. L. & Sm...	25	60,000	10.00	.....							10.00				110
Anaconda, c.....	25	1,200,000									33.00		33.50	32.50	45
Arcadian, c.....	25	150,000	7.00	6.50	6.50	6.00	6.50	6.25					5.75	5.50	644
Arnold, c.....	25	60,000													
Atlantic, c.....	25	40,000	39.00	38.50	39.50	38.50	41.00	40.00	42.00	41.00	41.50	39.00	40.00	39.50	2,410
Baltic	25	100,000	44.00	.....	45.00	44.50	46.00	45.00	47.00	46.00	48.00	45.00	46.00	45.25	4.490
Bingham, Cons....	50	150,000			29.50				29.75	29.00					200
Bonanza Dev.....	10	300,000	1.00	.....			1.06	.....			1.06	.....	1.00	.....	700
Boston, q.....	10	100,000													
Breece	25	200,000													
British Columbia...	5	200,000													
Cal. & Hecla, c....	25	100,000	665.	.....	665.	.....	665.	.....			664.	.....	650.	6.45	33
Catalpa	10	300,000													
Centennial, c.....	25	90,000			17.88	17.50					17.00	.....	17.00	16.25	640
Central Oil.....	25	60,650	9.00	.....	9.00	.....					7.50	.....	8.50	.....	260
Cochiti, g.....	10	193,750													
Cons. Mercur, g....	5	1,000,000	1.38	1.25	1.50	1.25	1.50	.....	1.50	.....	1.50	.....	1.50	.....	6,330
Con. Zinc & L. M. S.	10	110,000													
Copper Range, c...	25	100,000	60.50	.....	64.00	63.00	65.00	63.50	67.00	65.00	69.00	65.00	68.00	67.25	7,088
Daly-West	20	150,000	30.00	.....	32.00	.....	34.00	.....			32.25	31.50	30.13	.....	390
Dominion Coal.....	100	150,000	48.25	.....	47.13	47.00	46.50	46.00	48.00	47.50	47.75	.....	.....	.....	1,335
Dominion Coal, pf..	100	30,000													
Elm River, c.....	12	100,000									3.25	.....	.....	.....	150
Franklin, c.....	25	100,000	16.50	.....	16.50	.....			16.50	16.25	16.50	.....	.....	.....	125
Guanajuato Cons..	5	385,000	6.00	.....	6.25	6.00	6.25	6.00	6.00	.....	6.50	6.00	6.25	6.00	2,335
Humboldt, c.....	25	40,000													
I. Royale Con., c..	25	150,000	24.00	23.50	24.50	24.00	25.00	.....	25.25	24.00	24.50	23.50	24.50	23.75	2,210
Mass. Con., c.....	25	100,000	24.00	23.00	24.13	23.50	24.00	23.50	24.00	.....	24.50	23.00	23.50	23.00	3,100
Mayflower, c.....	25	100,000			3.50	.....	3.50	.....			3.50	.....	3.50	.....	300
Michigan, c.....	25	100,000	14.50	14.00	14.50	14.25			14.50		14.88	14.50	14.25	14.00	750
Mohawk, c.....	25	100,000	41.50	.....	42.75	41.50	42.50	42.00	43.00	.....	43.50	42.00	42.50	42.25	2,640
Mont. C. & C.....	25	200,000											4.00	.....	50
National	25	100,000													
N. E. Gas & Coke..	100	100,000	9.75	7.50	9.50	7.75	8.50	6.00	6.50	6.00	6.50	6.13	6.25	6.00	5,721
Old Colony, c.....	25	100,000	4.83	.....	5.00	.....	4.75	4.50			4.00	.....	4.63	.....	449
Old Dominion, c....	25	150,000	26.50	26.00	27.50	26.50	27.25	27.00	26.25	.....	26.00	25.25	26.50	25.00	2,020
Osceola, c.....	25	93,000	100.	99.50	101.	99.00	101.	.....	101.	99.50	101.	98.00	100.	98.00	2,693
Parrot, s. c.....	10	229,850	36.88	36.75	37.25	37.00			37.25	37.00	36.75	36.00	36.00	35.50	825
Phoenix Con., c....	25	100,000							5.75		6.00	.....			50
Quincy, c.....	25	100,000			155.										40
Rhode Island, c....	25	100,000	4.00	3.75	4.00	.....			4.00	.....	3.75	3.63			185
Santa Fe, g, c.....	10	250,000			4.13	.....	4.38	4.25	425.	.....	4.50	4.00	4.25	4.00	1,640
San Ysabel, g.....	5	130,000													
Shawmut Oil.....	25	50,000													
Tamarack, c.....	25	60,000	290.	.....					287.	.....	290.	285.	285.	275.	93
Tecumseh, c.....	25	80,000	2.00	.....			2.00	.....			2.00	.....	2.00	1.75	285
Trimountain, c....	25	100,000	43.50	.....	44.50	43.00	44.50	.....	44.50	44.00	47.50	42.63	44.50	.....	1,012
Trinity, c.....	25	160,000	25.75	.....	26.00	25.50	26.00	25.00	25.00	.....	25.50	25.00	25.50	25.00	1,590
Union, C. L.....	25	80,000													
United States, g...	25	250,000	15.38	15.13	15.50	15.25	15.75	15.38	16.00	15.75	15.50	15.25	15.00	.....	705
U. S. Oil.....	25	100,000	14.50	13.00	14.13	13.50	14.50	13.75	14.75	14.00	14.50	13.63	14.50	13.63	7,329
Utah Con., g.....	5	300,000	23.00	.....	23.00	22.50	23.50	23.00	23.00	22.75	22.75	22.25	22.50	.....	1,758
Victoria, g.....	25	100,000	6.75	.....	7.00	.....	7.25	7.00	.....	.....	.....	.....	7.00	6.63	625
Washington, c.....	25	60,000													
Winona, c.....	25	100,000			2.00	.....			2.50	.....			2.25	2.13	1,900
Wolverine, c.....	25	60,000	58.50	58.00	58.50	.....	59.75	59.50	60.00	.....	58.50	58.13	59.50	58.25	435
Wyandot, c.....	25	100,000					1.50	1.00	1.50	.....	1.75	.....	.....	.....	875

Official quotations, Boston Stock Exchange. Total sales, 137.256 shares.

ST. LOUIS, MO.* Nov. 25.

Name.	Shares.	Par.	Bid.	Ask.	Name.	Share.	Par.	Bid.	Ask.
Am.-Nettie, Colo....	300,000	$10	$1.10	$1.30	Doe Run Lead, Mo.	10,000	100	128.00	130.00
Catherine Lead, Mo.	50,000	10	2.75	4.00	Granite Bimet, Mt.	1,000,000	10	3.00	3.30
Central Lead, Mo...	10,000	100	130.00	135.00	K. & Tex. Coal, Mo.	25,000	100	44.00	45.00
Columbia Lead, Mo.	50,000	10	12.00	13.00	Renault Lead, Mo..	30,000	10	9.50	11.00
Con. Coal, Ill.....	50,000	100	18.00	21.00	St. Joe Lead, Mo...	300,000	10	17.50	20.00

*From our special correspondent.

SPOKANE, WASH. * Oct. 23.

Name of Company.	Par val.	B.	A.	Sales.	Name of Company.	Par val.	B.	A.	Sales.
Black Tail	$1	.09	.09½	1,000	Princess Maud.....	0.10	.02⅛	.02½	....
Crystal	1	.06¾	.09½	....	Quilp	1	.20	.25	....
Deer Trail Con.....	1	.02⅝	.02⅞	1,500	Rambler Cariboo.....	0.25	.50	.52	1,000
Gold Ledge	1	.01⅛	.01⅜	....	Reservation	1	.04⅞	.05⅛	2,000
Lone Pine-Surp. Con..	1	.04½	.04¾	10,000	Sullivan	1	.09	.10¼	....
Morning Glory.....	0.10	.01½	.01⅞	7,000	Tom Thumb.....	1	.13¾	.14½	1,000
Mountain Lion.....	1	.23¼	.25¼	....					

SALT LAKE CITY.* Nov. 23

Name of Company.	Location	Shares.	Par Value.	Quotations. High.	Quotations. Low.	Sales.
Ajax	Tintic	300,000	$10	.81¾	.71¾	26,260
Anchor	Park City	150,000	10	....	....	
Bullion Beck	Tintic	100,000	10	....	....	
Carisa	Tintic	500,000	1	1.03	.76½	77,600
Con. Mercur	Mercur	1,000,000	5	1.62½	1.51	1,200
Creole	Park City	150,000	1	....	....	
Daly	Park City	150,000	20	....	....	
Daly West.....	Park City	150,000	20	34,10	27.50	4,605
Dexter	Tuscarora	200,000	5	....	....	
Eagle & B. Bell.....	Tintic	250,000	1	1.06	1.05	200
Grand Central.....	Tintic	250,000	1	3.05	....	500
Horn Silver	Frisco	400,000	25	....	....	
L. Mammoth	Tintic	150,000	1	2.30	1.87	1,320
Mammoth	Tintic	400,000	25	1.30	1.23	600
May Day	Tintic	400,000	.25	1.06	.87	34,900
Ontario	Park City	150,000	100	....	....	
Sacramento	Mercur	1,000,000	5	.16	.12	3,000
Silver King	Park City	150,000	20	79.00	75.00	25
Star Con.	Tintic	500,000	1	.34½	.31½	7,500
Swansea	Tintic	100,000	5	....	....	
So. Swansea	Tintic	300,000	1	....	....	
Showers Con.	Tintic	400,000	5	....	....	
Sunshine	Mercur	250,000	10	....	....	
Tetro	Tintic	500,000	5	.39	.33	15,100
Tesora	Tintic	400,000	1	.32	.25	53,000
U. Sunbeam	Tintic	150,000	1	.47	.45	11,450
Uncle Sam	Tintic	500,000	1	.90	.76	62,900
West Mng. Glory.....	Tintic	500,000	.10	.07	.06	5,100
Victor	Tintic	500,000	1	.62	.53	42,700
Yankee Con.	Tintic	500,000	1	3.97	3.56	1,500
Ben Butler	Bingham	500,000	1	.16	.15½	3,600
Boss Tweed	Tintic	250,000	1	.67	.63½	500
California	Park City	300,000	1	.76¼	.49½	32,500
Century	Park Valley	150,000	1	....	....	

*By our Special Correspondent. Total sales 461,113 shares.

CHEMICALS, MINERALS, RARE EARTHS, ETC. CURRENT WHOLESALE PRICES.

Abrasives—	Cust.	Meas.	Price.
Carborundum, f.o.b. Niagara Falls, Powd., F. FF. FFF..	lb.		$0.08
Grains	"		.10
Corundum, N. C	"		.07@.10
Chester, Mass	"		.04½@.05
Crushed Steel, f. o. b. Pittsburg	"		.05½
Emery, Turkish flour, in kegs	"		.03½
Grains, in kegs	"		.05@.05½
Naxos flour, in kegs	"		.03½
Grains, in kegs	"		.05@.05½
Chester flour, in kegs	"		.03½
Grains, in kegs	"		.05@.05½
Peekskill, f.o.b. Easton, Pa., flour, in kegs	"		.01½
Grains, in kegs	"		.02½
Crude, ex-ship N. Y.; Abbott (Turkey)	lg. ton		26.50@30.00
Afrodissia (Turkey)	"		23.00@24.00
Kuluk (Turkey)	"		22.00@24.00
Naxos (Greek) h. gr	"		.26.00
Garnet, as per quality	sh. ton		25.00@35.00
Pumice Stone, Am. powd	lb.		.01@.02
Italian, powdered	"		.01½
Lump, per quality	"		.04@.40
Rottenstone. ground	"		02½@.04½
Lump. per quality	"		.03@.20
Rouge, per quality	"		.10@.30
Steel Emery. f.o.b. Pittsburg	"		.07
Acids—			
Boracic, crystals	"		.10¾@.11
Powdered	"		.11¼@.11½
Carbonic, liquid gas	"		.12½
Chromic, crude	"		.20
Chem. pure	"		.50
Hydrofluoric, 36%	"		.06
48%	"		.05
Best	"		.25
Sulphurous, liquid anhy	"		.08
Alcohol—Grain	gal.		2.53
Refined wood, 95@97%	"		.60@.65
Purified	"		1.20@1.50
Alum—Lump	100 lbs.		1.75
Ground	"		1.85
Powdered	"		3.00
Chrome, com'l	"		2.75@3.00
Aluminum—			
Nitrate	lb.		1.50
Oxide, com'l, common	"		.03½
Best	"		.20
Pure	"		.80
Hydrated	100 lbs.		2.60
Sulphate, pure	"		1.50@2.00
Com'l	"		1.15@1.25
Ammonia—			
Aqua, 16°	lb.		.03
18°	"		.03¼
20°	"		.03¾
26°	"		.05½
Ammonium—			
Bromide, pure	"		.53@.53
Carbonate, lump	"		.08¼@.08½
Powdered	"		.09@.09¼
Muriate, grain	"		5 ⅞
Lump	"		.08⅝
Nitrate, white, pure (99%)	"		.12
Phosphate, com'l	"		.09
Chem., pure	"		.60
Antimony—Glass	"		.30@.40
Needle, lump	"		.05½@.06
Powdered, ordinary	"		.05¾
Best	"		.08½
Oxide, com'l white, 95%	"		.09½
Com'l white, 99%	"		.12
Com'l gray	"		.07
Sulphuret com'l	"		.16
Arsenic—White	"		.03½@.03⅝
Red	"		.07@.07¼
Asphaltum—			
Ventura, Cal	sh. ton		32.00
Cuban	lb.		.01½@.03½
Egyptian, crude	"		.05½@.06
Trinidad, refined	sh. ton		35.00
San Valentino (Italian)	lg. ton		16.00
Seyssel (French), mastic	sh. ton		21.00
Gilsonite, Utah, ordinary	lb.		.03
Select	"		.03¾
Barium—			
Carb. Lump, 80@90%	sh. ton		25.00@27.50
92@98%	"		26.00@29.00
Powdered, 80@90%	lb.		.01¾@.02
Chloride, com'l	100 lbs.		1.67½@1.76
Chem. pure cryst	lb.		.05
Nitrate, powdered	"		.05½

Barium—	Cust.	Meas.	Price
Oxide, com'l, hyd. cryst	lb.		$0.18
Hydrated pure cryst	"		.25
Pure powd	"		.27
Sulphate (Blanc Fixe)	"		.02
Barytes—			
Am. Crude, No. 1	sh. ton		9.00
Crude, No. 2	"		8.00
Crude, No. 3	"		7.75
German, gray	"		14.50
Snow white	"		17.00
Bauxite—Ga. or Ala. mines:			
First grade	lg. ton		5.50
Second grade	"		4.75
Bismuth—Subnitrate	lb.		1.40
Subcarbonate	"		1.65
Bitumen—"B"	"		.03½
"A"	"		.05
"A" and "B"	"		.04½
Bone Ash	"		.02¼@.02½
Borax	"		.07¼@.07½
Bromine	"		.04
Cadmium—Metallic	lb.		1.40
Sulphate	100 lbs.		2.00@2.50
Calcium—Acetate, gray	"		1.25
" brown	"		.85
Carbide, ton lots f.o.b. Niagara Falls, N. Y., or Jersey City, N. J.	sh. ton		75.00
Carbonate, ppt	lb.		.05
Chloride, com'l	100 lbs.		.75
Best	"		.80@1.00
Sulphite	lb.		.05
Cement—			
Portland, Am., 400 lbs	bbl.		1.50@2.00
Foreign	"		1.65@2.25
"Rosendale," 300 lbs	"		.85
Slag cement, imported	"		1.65
Ceresine—			
Orange and Yellow	lb.		.12
White	"		.13½
Chalk—Lump, bulk	sh. ton		2.45
Ppt. per quality	lb.		.03¾@.06
Chlorine—Liquid	"		.30
Water	"		.10
Chrome Ore—			
(50% ch.) ex-ship N. Y	lg. ton		24.75
Sand. f.o.b. Baltimore	"		33.00
Bricks. f.o.b. Pittsburg	M		175.00
Clay, China—Am. com., ex-dock, N. Y	lg. ton		8.00
Am. best, ex-dock, N. Y	"		9.00
English, common	"		12.00
Best grade	"		17.00
Fire Clay, ordinary	sh. ton		4.25
Best	"		6.00
Slip Clay	"		5.00
Coal Tar Pitch	gal.		.08
Cobalt—Carbonate	lb.		1.75
Nitrate	"		1.50
Oxide—Black	"		2.26@2.30
Gray	"		2.28@2.40
Smalt, blue ordinary	"		.06
Best	"		.20
Copperas	100 lbs.		.30@.35
Copper—Carbonate	lb.		.18
Chloride	"		.25
Nitrate, crystals	"		.35
Oxide, com'l	"		.19
Cream of Tartar	"		.19¼@.19¾
Cryolite	"		.06½
Explosives—			
Blasting powder, A	25 lb. keg		2.65
Blasting powder, B	"		1.40
"Rackarock," A	lb.		.25
"Rackarock," B	"		.18
Judson R.R. powder	"		.10
Dynamite (20% nitro-glycerine)	"		.13
(30% nitro-glycerine)	"		.14
(40% nitro-glycerine)	"		.15
(50% nitro-glycerine)	"		.16½
(60% nitro-glycerine)	"		.18
(75% nitro-glycerine)	"		.21
Glycerine for nitro (32 2-10° Be.)	"		.13@.13¼
Feldspar—Ground	sh. ton		8.00@9.00
Flint Pebbles—Best, Danish	lg. ton		14.75
Best, French	"		11.75

Fluorspar—	Cust.	Meas.	Price
Am. lump, 1st grade	sh. ton		$14.40
2d grade	"		13.90
Gravel and crushed, 1st gr.	"		13.40
2d grade	"		12.40
Ground, 1st grade	"		17.90
2d grade	"		16.50
Foreign, lump	"		8.00@12.00
Ground	"		11.50@14.00
Fuller's Earth—Lump	100 lbs.		.75
Powdered	"		.85
Refined lump	"		1.25
Graphite—Am. f.o.b. Providence, R. I., lump	sh. ton		8.00
Pulverized	"		30.00
German, som. pulv	lb.		.01¼@.01½
Best pulverized	"		.01½@.02
Ceylon, common pulv	"		.02¾@.03½
Best pulverized	"		.04@.08
Italian, pulv	"		.01¼
Gypsum—Ground	sh. ton		8.00@8.50
Fertilizer	"		7.00
Rock	lg. ton		4.00
English and French	"		14.00@16.00
Infusiorial Earth—Ground.			
American, best	"		20.00
French	"		37.50
German	"		40.00
Iodine—Crude	100 lbs.		2.45
Iron—Muriate	lb.		.05
Nitrate, com'l	"		.01¼
True	"		.04
Oxide, pure copperas col	"		.05@.10
Purple-brown	"		.02
Venetian red	"		.01@.01½
Scale	"		.01@03
Kaolin—(See Clay. China.)			
Kryolith—(See Cryolite.)			
Lead—Acetate, white	"		.07¾@.08
Brown	"		.06
Nitrate, com'l	"		.06½
" gran	"		.08¼
Lime—Com., abt. 250 lbs	bbl.		.70
Finishing	"		.90
Magnesite—Greece.			
Crude (95%)	lg. ton		6.50@7.00
Calcined	sh. ton		14.00@15.00
Bricks	M		170.00
Am. Bricks, f.o.b. Pittsburg	"		175.00
Magnesium—			
Carbonate, light, fine pd	lb.		.04½
Blocks	"		.06@.07
Chloride, com'l	"		.01¾
Fused	"		.20
Nitrate	"		.60
Sulphate	100 lbs.		.75@.95
Manganese—Powdered, 70@75% binoxide	lb.		.01¼@.01½
Crude, pow'd.			
75@85% binoxide	"		.01½@.02¼
85@90% binoxide	"		.02¼@.03¼
90@95% binoxide	"		.03¼@.05½
Carbonate	"		.16@.20
Chloride	"		.04
Ore, 50%, Foreign	unit		.23@.24
Domestic	"		.30
Marble—Flour	sh. ton		6.00@7.00
Mercury—Bichloride	lb.		.77
Mica—N. Y. gr'nd, coarse	"		.03@.04
Fine	"		.04@.05
Sheets, N. C., 2x4 in	"		.30
3x3 in	"		.80
3x4 in	"		1.50
4x4 in	"		2.00
6x6 in	"		3.00
Mineral Wool—			
Slag, ordinary	sh. ton		19.00
Selected	"		25.00
Rock, ordinary	"		32.00
Selected	"		40.00
Monazite—92%	"		140.00
Nickel—Oxide, No. 1	lb.		1.00
No. 2	"		.60
Sulphate	"		.20@.21
Oils—Black, reduced 20 gr.:			
25@30, cold test	gal.		.09¾@.10¼
15, cold test	"		.10¾@.11¼
Zero	"		.11¾@.12¾
Summer	"		.09¼@.09¾
Cylinder, dark steam ref	"		.08¾@.10¼
Dark, filtered	"		.11¼@.15¾
Light filtered	"		.14¾@.17¾
Extra cold test	"		.21¾@.26¾
Gasoline, 86°@90°	"		.14@.19
Naphtha, crude, 68°@72°	bbl.		9.05
"Stove"	gal.		.12
Linseed, domestic raw	"		.53@.55
Boiled	"		.57
Calcutta, raw	"		.85
Ozokerite	lb.		.11½
Paints and Colors—			
Chrome green, common	"		.05
Pure	"		.16
Yellow, common	"		.10¼
Best	"		.25
Lampblack, com'l	"		.04½
Refined	"		.07
Litharge, Am. powd	"		.04¼@.05¼
English flake	"		.08¼
Glassmakers'	"		.07¼@.08¼
Metallic, brown	sh. ton		19.00
Red	"		16.00
Ocher, Am. common	"		9.25@10.00
Best	"		21.25@25.00

Ocher—	Cust.	Meas.	Price
Dutch, washed	lb.		$.04¾
French, washed	"		.01¼@.02
Orange mineral, Am	"		.08¾@.09¼
Foreign, as to make	"		.08¾@.11¼
Paris green, pure, bulk	"		.12¼
Red lead, American	"		.05½
Foreign	"		.07¼@.08¾
Shellac, "D. C."	"		.34
Native	"		.22
Turpentine, spirits	gal.		.37¾
Ultramarine, best	lb.		.25
Vermilion, Amer. lead	"		.10@.14
Quicksilver, bulk	"		.70
Foreign	"		.80@.85
White lead, Am., dry	"		.04¾@.04¾
American, in oil	"		.05¾
Foreign, in oil	"		.07¼@.09¼
Whiting, common	100 lbs.		.40
Gilders	"		.45½
Zinc, white, Am., ex dry	lb.		.04¾@.04¾
American, red seal	"		.06¼
Green seal	"		.07
Foreign, red seal, dry	"		.05¾@.06
Green seal, dry	"		.08¾@.09
Potash—			
Caustic, ordinary	"		.04¾@.06
Elect. (90%)	"		.06¼
Potassium—			
Bicarbonate cryst	"		.08¼
Powdered or gran	"		.14
Bichromate, Am	"		.08¼
Scotch	"		.08¾@.09
Carbonate, hydrated	"		.04@.04¾
Calcined	"		.03½@.03¾
Chromate	"		.35
Cyanide (98@99%)	"		.24@.25
Iodide, bulk	"		2.05
Kainit	lg. ton		9.05
Manure salt, 20%	100 lbs.		.66
Double Manure salt, 48@53%	"		1.12
Muriate, 80@85%	"		1.83
95%	"		1.86
Permanganate, pure cr	lb.		.12¼@.12¾
Prussiate, yellow	"		.13½
Red	"		.37@.37¼
Silicate	"		.06
Sulphate, 90%	100 lbs.		2.11
96%	"		2.14
Sulphide, com'l	lb.		.10
Sylvinit	unit		.35½
Quartz—(See Silica).			
Salt—N. Y. com. fine	sh. ton		2.00
N. Y. agricultural	"		1.50
Saltpetre—Crude	100 lbs.		3.40@3.45
Refined	"		4.25
Silica—Best foreign	lg. ton		10.00@11.00
Ground quartz, ord	sh. ton		6.00@8.00
Best	"		12.00@13.00
Lump quartz	"		2.50@4.00
Glass sand	"		2.75
Silver—Chloride	oz.		.65
Nitrate	"		39¼
Oxide	"		85.@1.10
Slate—Ground, black	sh. ton		7.50@8.75
Ground, red and olive	"		20.00
Sodium—Acetate, com'l	lb.		.04
Bichromate	"		.06¼
Chlorate, com'l	"		.08¼@.08¾
Hyposulphite, Am	100 lbs.		1.60@1.65
German	"		1.70@1.90
Nitrate, 96@98%	lb.		.06
Peroxide	"		.45
Phosphate	"		.02¼
Prussiate	"		.10½
Silicate, conc	"		.05
Com'l	"		.01
Sulphate, com'l	100 lb.		.77½
Sulphide	lb.		.01¼
Sulphite crystals	"		.02½
Tungstate, com'l	"		.35
Sulphur—Roll	100 lbs.		1.85
Flour	"		1.90
Flowers, sublimed	"		2.15
Talc—N. C., 1st grade	sh. ton		13.75
N. Y., Fibrous, best	"		10.20
French, best	100 lbs.		1.25
Italian, best	"		1.62¼
Tar—Regular	bbl.		1.90
Oil barrels	"		3.80
Tin—			
Crystals	lb.		.20@.21½
Muriate, 30°	"		.09
52°	"		.15
Oxide	"		.40
Uranium—Oxide	"		2.25@3.00
Zinc—Metallic, ch. pure	"		.07@.09½
Carbonate	"		.15
Chloride	"		.05
Dust	"		.05¾@.05¾
Sulphate	"		.02¼@.02¾

THE RARE EARTHS.

	Cust.	Meas.	Price
Boron—Nitrate	lb.		$1.50
Calcium—Tungstate (Scheelite)	"		.80
Cerium—Nitrate	"		11.00
Didymium—Nitrate	"		35.00
Erbium—Nitrate	"		40.00
Glucinum—Nitrate	"		20.00
Lanthanum—Nitrate	"		30.00
Lithium—Nitrate	oz.		.60
Strontium—Nitrate	lb.		06¾@07
Thorium—Nitrate 49@50%	"		5.00
Uranium—Nitrate	oz.		.25
Yttrium—Nitrate	lb.		40.00
Zirconium—Nitrate	"		8.00

NOTE.—These quotations are for wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. Readers of the ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable. See also Market Reviews.